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ABSTRACT

Developed as a planning guide for the Computer Literacy Curriculum, a junior high course required by the Texas State Board of Education, this document presents objectives, student activities, and suggested resources that can be used for a full year or semester course. A list of computer literacy learning objectives interprets the essential elements for the course in behavioral terms and contains both student learning outcomes and supporting enabling objectives for five elements: computer related terminology and use; history and development of computers; use of the computer as a tool; communicating instructions to the computer; and problems and issues of computer use in society. Student activities suggest possible strategies for guiding students toward mastery of each objective. Also discussed are programming methodology; differentiated instruction for students with computer experience, for special education and for physically handicapped students; computer clubs; and keyboarding. Sample resources listed include books, journals, and student journals; software; audiovisuals; and directions for teacher-made materials such as games. (LMM)

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Computer Literacy: Curriculum Guide

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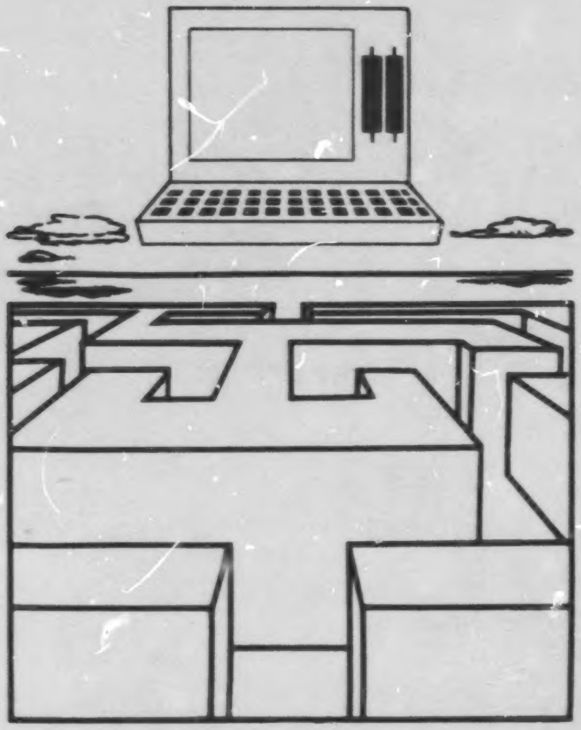
COMPUTER LITERACY

CURRICULUM GUIDE



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FOREWORD

The growing use of information technology is creating new opportunities and challenges in Texas education. To help prepare students to use modern tools, the State Board of Education included Computer Literacy as a part of the curriculum required in TAC, Chapter 75.

We hope this publication will assist teachers as they begin to offer this new and important curriculum to Texas students.

W. N. Kirby
Interim Commissioner of Education

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INTRODUCTION

The Texas State Board of Education has established a set of essential elements for Computer Literacy for all students. Beginning in September 1985, all districts in Texas will offer Computer Literacy as a required course to be taken at either the seventh or eighth grade. (TAC, Chapter 75.142 b8)

This document, developed as a guide for planning delivery of the Computer Literacy curriculum, includes: objectives, student activities, and suggested resources. While this guide is intended for use in the junior high course, it could be adapted to elementary computer literacy programs, with some modification.

The "Student Activities" section includes more activities than most students can accomplish in a single semester course. As a result, the material will accommodate various entry and ability levels of students, and will give classroom teachers some flexibility in planning for local implementation.

Although the Board requirement for computer literacy is focused at the junior high level, there is a provision for testing elementary youngsters who have been involved in computing. Students who can demonstrate competency in computer literacy on an approved competency test may be exempted from the junior high course. Districts are encouraged to begin teaching computer literacy elements at the elementary level. Skills associated with problem solving and process-oriented thinking are developmental and, therefore appropriate for elementary students.

Some districts may choose to offer Computer Literacy for one full year, instead of the required one semester. Others may choose to begin the curriculum in the elementary grades in order to focus the junior high course on more advanced topics. Local adaptation and flexibility are encouraged. Computer Literacy will be a dynamic, changing curriculum which Texas educators must continually up-date and review in order to provide relevant skills and knowledge to students.

COMPUTER LITERACY

Learning Objectives

COMPUTER LITERACY: LEARNING OBJECTIVES

This section is designed to interpret the essential elements for the course in behavioral terms. It contains both student learning outcomes and supporting enabling objectives.

The order in which the elements are presented need not be the order in which they are taught in the course. Many teachers may want to begin the course with one of the "hands-on" elements (3 or 4). For example, word processing could be taught early in the semester, followed by student assignments which require composition using the word processing skills already learned. This strategy not only gives students additional practice with new skills, it also demonstrates the relevance and application of these skills to realistic situations.

The terminology element can probably be best taught as a strand integrated within the other four elements. For example, terminology associated with programming can be taught as a part of the programming instruction.

Although there are five essential elements in Computer Literacy, teachers need not devote an equal amount of time to each one. The skill oriented, "hands-on" elements (numbers 3 and 4) will probably require far more class and laboratory time than the knowledge/information-based elements (numbers 1,2, and 5).

It should also be noted that element 4 (communicating instructions to the computer) involves developmental skills which take time for students to acquire. Teachers may want to introduce programming concepts and give students laboratory assignments at regular intervals during the semester in order to provide sufficient opportunity to practice these skills.

COMPUTER LITERACY: LEARNING OBJECTIVES

I. COMPUTER RELATED TERMINOLOGY AND USE	
LEARNING OUTCOMES	ENABLING OBJECTIVES
A. Identify Computer Terminology.	1. Identify TERMS related to computer programming and languages, i.e., BASIC, Pascal, Logo, FORTRAN, debug, cursor, algorithm, topdown design, iterate, array, program, graphics, computing science, etc. 2. Identify TERMS related to computer hardware and peripherals, i.e., input, output, keyboard, monitor, CRT, disk drive, diskette, peripheral, printer, modem, chip, integrated circuit (IC), LSI, VLSI, RAM, ROM, etc. 3. Identify TERMS related to computer applications and operating system, i.e., simulation, word processing, data processing, software, disk operating system (DOS), backup, computer aided design, computer aided manufacturing, robotics, etc.

	4. Identify TERMS designating the various categories of computers, i.e., mainframe, minicomputer, microcomputer, lap, portable, 1st, 2nd, 3rd, 4th, 5th generation computers, etc. 5. Identify TERMS relating to computer measurement and data transmittal, i.e., bit, byte, kilobyte, megabyte, digit, data, baud memory, text, machine code, nanosecond, picosecond, microsecond, off-line, on-line, telecommunication, distance networking, local area network (LAN), on-line database, electronic mail, etc.
B. List the uses of computers in a variety of situations.	1. Describe computer applications in the following areas: .business .health .education .home .transportation .government and politics .crime prevention .arts, humanities, sports, games .science, engineering, and research 2. Explain ways computers are used in everyday life.

C. Understand advantages and disadvantages of using computers.	1. List computer attributes that make them unique tools: .speed .accuracy .performing repetitive task .making logical decisions .programmability .performing arithmetical functions .manipulating data sets 2. Describe attributes which can limit a computer's usefulness: .cost .availability of software .storage capacity .ease of use .limitations in higher order thinking .inability to synthesize information .inability to originate new ideas
D. Identify different types of computers.	1. Differentiate among micro-, mini- and mainframe computers. 2. Differentiate between analog and digital computers. 3. Recognize capabilities of different computer types (based on word size, speed, storage capacity, and other unique attributes).

II. HISTORY AND DEVELOPMENT OF COMPUTERS	
A. Identify and describe important pre-computer aids to calculation (i.e., counting with fingers and toes, pebbles and stones, base 10 numeration system, and counting with the abacus).	
B. Name individuals and describe their contributions to the historic origins of the computer	1. Describe the contributions of John Napier: the introduction of logarithms, invention of Napier's rods. 2. Describe the contributions of Blaise Pascal: first mechanical adding machine. 3. Describe the contribution of Gottfried Von Leibnitz: first mechanical calculating machine. 4. Describe the contributions of Joseph Jacquard: punched cards. 5. Describe the contributions of Charles Babbage: difference and analytical machine.

	6. Describe the contributions of Herman Hollerith: Tabulating machine. 7. Describe the contributions of Ada Byron Lovelace: First Programmer 8. Describe the contributions of John Mauchly and J. Presper Eckert: designers of ENIAC computer. 9. Describe the contributions of Howard Aiken: designer of the Mark I 10. Describe the contributions of Dr. John von Neumann: recommended use of binary system internally and stored program concept
C. Identify and describe characteristics of each generation of computers.	1. Describe the characteristics of 1st generation computers (tubes). 2. Describe the characteristics of 2nd generation computers (transistors). 3. Describe the characteristics of 3rd generation computers (integrated circuits). 4. Describe the characteristics of 4th generation computers (large scale integrated circuits).

III. USE OF THE COMPUTER AS A TOOL	
A. Perform basic computer operating procedures.	1. Demonstrate how to insert a disk, turn on the computer, and boot a program. 2. Demonstrate the ability to stop, escape from, and continue a program 3. Run a program from a catalog and/or menu. 4. Recognize simple error messages (syntax error, break in #, etc.) 5. Demonstrate the proper care of hardware, disk,etc. 6. Use appropriate peripheral devices for particular tasks. (i.e., printer, graphics tablet, etc.) 7. Demonstrate the ability to transfer, add and delete files.

B. Develop sufficient keyboarding skills for use of commercial software.	1. Demonstrate effective use of numeric and alphabetic keys. 2. Identify and use special purpose keys.
C. Use commercial software packages in a variety of applications.	1. Use a word processor to generate documents such as letters, school reports, or homework. 2. Use a data-filing system for simple data storage and retrieval, such as a simple phone or address listing. 3. Use a spread-sheet package to solve a meaningful problem such as checkbook calculations. 4. Use graphics utilities to solve problems such as computer aided design of floor plans.

	5. Use the computer for other applications, based on software availability.
D. Demonstrate the ability to review and evaluate commercial software as to its effectiveness for intended purpose and ease of use.	
E. Identify the kinds of applications software appropriate for given tasks.	
F. Demonstrate skills for data entry and error checking in the context of application packages, such as a data-filing system.	

IV. COMMUNICATING INSTRUCTIONS TO THE COMPUTER	
A. Use and develop flowcharts and top-down design as a means of expressing algorithms.	1. Use flowcharting to express simple algorithms for sequential process, decision making (if-then), and looping. 2. Plan a program algorithm using top-down design methodology requiring more than one level of refinement.
B. Learn the syntax of a high-level language. (BASIC examples will be given. Other appropriate languages will be LOGO and Pascal.)	1. Identify the valid forms for constants, variables, and operation symbols used in standard BASIC. 2. Differentiate between numeric and string variables in BASIC.

	3. Differentiate between commands and statements in BASIC. 4. Identify and use variable assignment (LET, INPUT, DATA/READ) 5. Identify and use various formats for output in BASIC, (PRINT statement with comma, semicolon, and tab for formatting) 6. Identify and use control statements in BASIC .the GOTO statement .the IF/THEN statement .the FOR-NEXT statement .the GOSUB statement 7. Identify and properly use subroutines in BASIC. 8. Correctly predict the output of a given program sequence in BASIC. 9. Demonstrate skills in debugging programs in BASIC.

C. Develop problem-solving skills	1. Describe a problem-solving cycle: .analyze the problem .develop the algorithm .code the program .execute the program .test the program .correct the program .document the program 2. Use the problem-solving cycle to solve a simple problem.
D. Write reasonably structured programs (modular in nature).	Develop a program solution made up of a series of subordinate solutions, each represented as a subroutine called from a main program.

V. PROBLEMS AND ISSUES OF COMPUTER USE IN SOCIETY	
A. Identify computer-related careers, including training requirements.	1. Describe the responsiblities of operations personnel: .computer operators .keypunch operators .data-entry operators 2. Describe responsiblities of systems and programming personnel: .systems analyst .applications programmer .systems programmer .database specialist 3. Describe responsibilities of the computer technician. 4. Describe responsibilities of computer development personnel: .computer scientist .engineers .assemblers
B. Describe the impact of automation on the job market.	

	1. State the value of computer skills for future employment. 2. List issues related to the effects of computers on employment (eg., job displacement, retraining, changes in types of skills necessary for certain jobs).
C. Identify the importance of ethics in accessing and manipulating automated information.	1. Describe examples of computer fraud and misuse. 2. Describe factors in maintaining security in an automated environment. 3. Explain issues related to safeguarding individual privacy.
D. Identify the legal issues and potential solutions pertaining to computer use.	1. Describe examples and problems associated with computer-related law.

	2. Describe copyright issues as they relate to computer software. 3. Identify issues related to crime and computer use.

STUDENT ACTIVITIES

ACTIVITIES

The activities listed in this section suggest possible strategies for guiding students toward mastery of the essential elements for Computer Literacy. Teachers may want to provide additional or different activities for each objective.

It is not necessary for students to complete each of the suggested activities. Rather, teachers should choose activities they feel are appropriate for use in the course, based on local student need.

Teachers should not view this section of the curriculum guide as a substitute for a textbook or other commercially available materials. Additional supporting materials may be required to fully implement the course.

Some of the listed activities may be modified for special populations of youngsters. For example, some activities may require adaptation to accommodate varying reading levels, learning styles, or student attention spans.

STUDENT ACTIVITIES
ELEMENT ONE:
Computer Related Terminology and Use

OBJECTIVE A: IDENTIFY COMPUTER TERMINOLOGY

-Play computer terminology bingo. Mark answers on a bingo-like game card as the teacher calls out the definition for a word on your card. The student who completely fills out the card first wins.

-Play the card game "I Have/Who Has." (Note to teacher: to play the game, each student in the class is given only one card and must listen carefully so that they can respond at the proper time. See the section on "teacher made materials" for instructions .)

-Write a computer "hacker" dictionary by compiling a list of slang terms used with computers and define each one in a class-generated "hacker dictionary." (Note: Students may want to use a word processing or data-filing system for this activity.)

-Develop a classroom computer file describing various types of hardware from computer store ads, catalogs, and flyers. Organize the descriptions into categories for input, output, central processing unit, and memory.

-Use various resources (newspaper ads, magazine articles, etc.) to find definitions of computer terms. Compile a computer/technology dictionary.

-Discuss how high technology has contributed to language development. For example, research the term "bug" and its meaning in the context of computer programming.

-Collect ads for different types of computer hardware and "build" computer systems by using the pictures and descriptions for different types of equipment. Discuss whether the hardware comprising the systems are compatible.

-Draw a computer diagram to show how data entry and processing occur. Words to use: input, memory, CPU, disk drive, keyboard, output, monitor, and printer.

-Pretend you have been given responsibility for purchasing equipment for your school microcomputer laboratory. Look through computer catalogs to locate hardware. Be able to defend your reasons for selecting the equipment, including all recommended peripherals.

-Demonstrate computer concepts of input, output, and process by using a popcorn popper. Explain that "inputting" is like pouring the popcorn into the popper, "process" is similar to the heating up and popping action going on in the popper, and the popped popcorn is the output.

-Write a short story using as much computer terminology as possible. Use your word processing skills for this activity.

-Bring to class computer-related periodicals, newspaper articles, and journals. Present summaries of these readings to the class.

OBJECTIVE B: LIST USES OF COMPUTERS IN A VARIETY OF SITUATIONS

-Go on a scavenger hunt with two or three other students to locate as many computer-related or produced items (Ex.: library cards, keypunch cards, automated bank teller receipts) as possible. Share your finds with other groups by explaining how these products are used. The group with the most items found wins the hunt.

-Invite the business manager of the local school district to speak to the class about the types of tasks handled by the school computer.

-List all the activities you usually perform in a typical day. Star each activity that could be affected by a computer (Ex.: waking up with a digital alarm clock, eating breakfast cereal that has Universal Product Codes on the package). Compare lists and discuss the impact of computers on daily life.

-Present an oral report to the class on the use of computers in a particular application, such as government, business, science, medicine, or recreation. Use posters or other visual aids to enhance your presentation.

-Collect magazine or newspaper articles about computer applications. Compile a file of all articles which will be made available to class members. This file could be catalogued using a data-filing system.

-Take a field trip to observe on-the-job use of computers. (ex.: local business, library, bank). Find out what the computer does, how the job was completed before computers were used, what types of information it handles, and how information is to be input and retrieved from the computer.

-Find articles about computer use in different settings. Categorize the application by area, such as computers in science, art, medicine, etc. Make a bulletin board display with the articles.

-Define the Universal Product Code (UPC) and tell how grocery stores use computers and the code to stock the store and price items.

-Interview parents and other adults to determine how computers have affected their lives and their work.

-Describe ways in which computers are used in simulations. What problems can you detect in this application? (ie., accuracy of models).

-Visit the science department at a nearby university. In what ways are computers being used for investigation and research?

-List as many databases that affect your life as possible (airlines, medical records, banks, school files, government offices, etc.). What categories of information are contained in each file?

-Report how computers might be used in the average American home. Discuss embedded microprocessors, such as those found in cars or microwave ovens.

-Research how computers play chess at various levels of expertise and describe how the best program works.

-Find out about programs which play several different card games and tell how they work.

-Write a description of daily life in an ideal technological future. Describe daily routines, work, education, homemaking, etc., as they might be affected by computer technology of the future.

-Make a list of all the people you meet in a 24 hour period who have some connection with computers. Describe that connection and share results in class.

-Suppose a computer became an official judge at the Olympics. What would be the advantages of automated judging? What sports would be easy to judge with the help of a computer? What problems could occur? Write a short story or play about Olympic Games you organize in the year 2000.

-Suppose you were able to rent a fully automated house, complete with robots and talking refrigerators. Describe such a house and the computer systems it might include.

OBJECTIVE C: UNDERSTAND ADVANTAGES / DISADVANTAGES OF USING COMPUTERS

-List types of information that a computer might remember more efficiently than a person. Some examples might be a long list of numbers, a list of all the students in a school, all items for sale in a catalog, or a list of all eligible voters in a town. Discuss the different ways in which a computer could examine this data.

-Work in teams to do research on a field of occupations such as science, education, government, or medicine. Each group can discuss the "human" tasks and "computer" tasks in the field studied.

-Pick an occupation or field and pretend to be the boss. List the major activities in your office or factory. Check those which could be accomplished by a computer. Which activities could be done best by people? List the major factors which helped you make your decisions.

-Put names and addresses of five of your friends on five index cards. Time yourself while you put these cards in alphabetical order. Now key these names and addresses into the computer using a data-filing system. Ask for an alphabetical list and compare the time needed by the computer for this task with the time you needed.

OBJECTIVE D: IDENTIFY DIFFERENT TYPES OF COMPUTERS

-Visit a company, business, bank or factory that uses a mainframe computer. Look for (1) the four main parts of a computer sytem, (2) different types of peripheral devices, and (3) kinds of jobs performed.

-Work in groups to study mainframe computers, minicomputers, or microcomputers. Look through computer catalogs and ads to locate models in the category your group is studying and then develop a catalog of the models, noting speed, memory, cost, and applications.

-Collect pictures of mainframe computers, minicomputers, and microcomputers. Label and place in a computer notebook. Make a bulletin board display of each type, including a picture, description, and typical application.

-Discuss analog and digital computers. Give examples of each.

STUDENT ACTIVITIES
ELEMENT TWO:
History and Development of Computers

OBJECTIVE A: IDENTIFY AND DESCRIBE IMPORTANT PRE-COMPUTER AIDS TO CALCULATION.

-Choose one of the following to investigate. Write a report, build a model, or obtain the device itself and demonstrate it to the class.

- abacus
- Napier's rods
- slide rule
- Pascaline machine

-Write a report on the history of slide rules, beginning with Napier's bones.

-Create an abacus of your own and demonstrate its use to the class. In which countries is the abacus still used?

-What makes the computer different from the pre-computer aids to calculation? (i.e., ability to manipulate words as well as numbers, ability to perform iterative tasks, ability to store large quantities of information, etc.)

OBJECTIVE B: NAME INDIVIDUALS AND DESCRIBE THEIR CONTRIBUTIONS TO THE HISTORIC ORIGINS OF THE COMPUTER.

-Identify places on a world map where significant events in computing history took place.

-Pretend you are a reporter for a daily newspaper. Write an article on an important event in computing history, including all pertinent details: Who? What? Where? When?Why?How?

-Make a historical timeline of important events in computing history beginning with 3000 B.C.

-Write a short research paper on silicon -- how it is found, what it is made from, etc.

-Create a timeline, "The History of Computers," for a classroom bulletin board display. Include the inventor's name and his/her contribution.

-Locate encyclopedia sets from the 1970's, 1960's, 1950's, 1940's, etc. Research different computer topics to determine the types of changes that have occurred in the references over the years.

-Work in pairs to develop skits about major events in computing history.

-Invite a computer representative from IBM, Honeywell, Burroughs, Univac, or a similar company to discuss the history of that company's computers and its future plans.

-Explain the statement, "Necessity is the mother of invention," as it relates to the development of computing devices.

-Match the names of 10 important persons in computer history with the contributions to computing made by each of those persons.

-Play a game using famous people associated with the history of computing and their contributions. (i.e., TIC-TAC-TOE, Match Game, Password, scrambled egg, etc.)

-Travel through the "time tunnel" and interview a famous inventor who has made a significant contribution to computing. Write the article for publication in a classroom computer magazine. (Use your word processing skills for this activity.)

-Prepare a bulletin board "Hall of Fame" with pictures (or drawings) and paragraphs about famous people and events in computing history.

-Research the involvement of key women in the development of the modern computer.

-A programming language, Ada, has been named after Countess Augusta Lovelace, the first computer programmer. Write a report about her and the language which bears her name.

-Write a report about Charles Babbage, the "Father of Computing." Why is he given this title?

-Put the names of several people associated with the history of computing into a hat. Each student draws a name and writes a report on the significant contributions of each individual.

OBJECTIVE C: IDENTIFY AND DESCRIBE CHARACTERISTICS OF EACH GENERATION OF COMPUTERS

-Research the vacuum tube, the transistor, the integrated circuit, and the chip. Explain how each one has helped advance computer technology. Discuss each one individually in terms of speed, cost advantages, size, etc.

-Construct a family tree of computers. Display actual pictures or drawings of the different types of computers on the tree.

-Draw a timeline on the bulletin board showing the different generations of computers.

-What is a fifth generation computer? Describe possible applications. How does it differ from fourth generation machines?

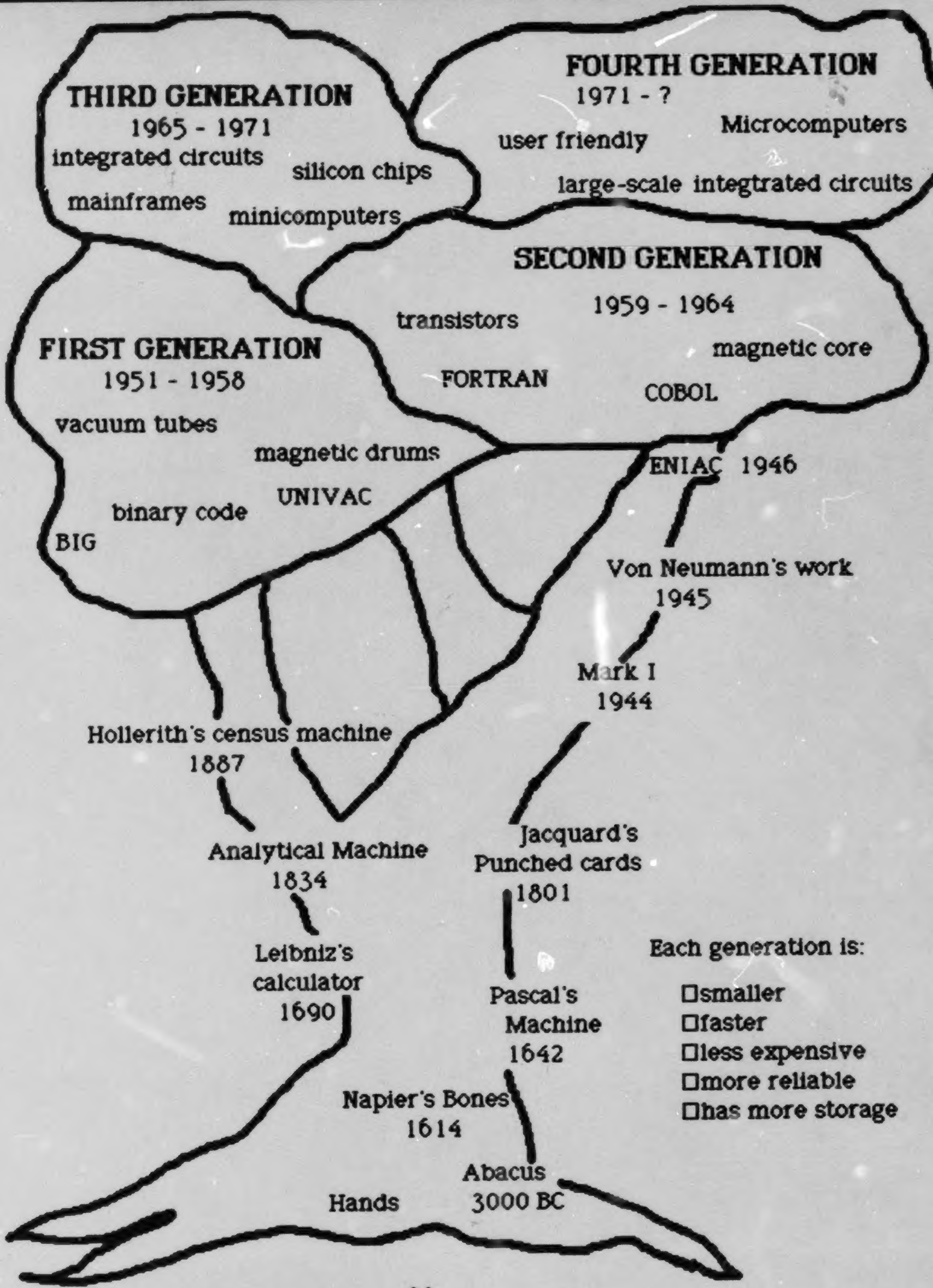
-Bring a vacuum tube, transistor, integrated circuit, and integrated circuit chip to the class. Make drawings of each one, indicating relative sizes.

-Research the quest for the fifth generation computers. Explain why they might be called "knowledge processors" instead of "data processors."

-Break open the protective cover of some "dead chips" obtained from a computer store and examine them with the aid of a magnifying glass and then under a microscope.

-Study magazine articles about the EPCOT Center at Walt Disney World (Orlando, FL). Make notes about computer use in the future. Report findings to the rest of the class.

-In what ways are the histories of the atomic bomb, television, and the automobile relevant to the present and future development of the computer?


THIRD GENERATION
1965 - 1971
integrated circuits
silicon chips
mainframes
minicomputers
FOURTH GENERATION
1971 - ?
user friendly
Microcomputers
large-scale integtrated circuits
SECOND GENERATION
1959 - 1964
transistors
magnetic core
FORTRAN
COBOL
FIRST GENERATION
1951 - 1958
vacuum tubes
magnetic drums
UNIVAC
binary code
BIG
ENIAC 1946
Von Neumann's work
1945
Mark I
1944
Hollerith's census machine
1887
Analytical Machine
1834
Jacquard's
Punched cards
1801
Leibniz's
calculator
1690
Pascal's
Machine
1642
Napier's Bones
1614
Abacus
3000 BC
Hands

Each generation is:

- ☐smaller
- ☐faster
- ☐less expensive
- ☐more reliable
- ☐has more storage

STUDENT ACTIVITIES
ELEMENT THREE
Using the Computer as a Tool

OBJECTIVE A: PERFORM BASIC COMPUTER OPERATING PROCEDURES

-Explain the do's and don'ts of handling disks to another student. Relate at least seven items of information.

-Make a drawing of a microcomputer system. Label and list the function of each peripheral.

-Develop a list of rules for the class which identify proper care of hardware and software.

-Issue a "Computer Operator Certificate" to qualified users in the class. Students (with teacher direction) should develop a qualification checklist for the certificate.

-Load the system utility disk which came with the computers in your classroom. Run several of the programs on this disk and explain the function of each. Make a bulletin board display of this information for easy reference.

-Use system utilities to transfer, add, or delete files.

-Use system utilities to initialize blank disks and discuss why this is required.

-Discuss why software disks used on different brands of personal computers are not generally compatible.

-Make a list of common error messages or problems in using your computers. Describe possible reasons for each error or problem, and list possible "next steps" or solutions.

OBJECTIVE B: DEVELOP SUFFICIENT KEYBOARDING SKILLS FOR USE WITH COMMERCIAL SOFTWARE.

-Make a picture of a computer keyboard on cardboard. Working with a partner, take turns asking each other to point to a particular key quickly.

-Identify the special purpose keys on your computer. Make a chart which describes these keys and their function(s).

-If possible, use commercially available software to practice keyboarding skills. (See section on keyboarding in this document.)

-List the ways in which a computer keyboard differs from a typewriter keyboard.

OBJECTIVE C: USE COMMERCIAL SOFTWARE PACKAGES IN A VARIETY OF APPLICATIONS

Word Processing:

-Load a word processing program into your computer. Using either the manual or an interactive tutorial, practice typing and moving the cursor. Now try deleting characters or words and inserting characters or words.

-Using the manual for your word processing program, identify the processes for performing the tasks listed below. Make a chart of this information for easy reference and post it on a bulletin board or in a large notebook.

- -cursor movement
- -tab setting
- -deleting a character
- -deleting a word
- -deleting a line
- -inserting a character
- -inserting a word
- -inserting a line
- -searching

-replacing
-identifying blocks
-moving blocks
-adjusting margins
-saving documents
-retrieving documents
-printing documents

-Take a poorly written document (misspelled words, incorrect punctuation, sentences out of order, etc.) and make corrections by hand. Demonstrate the process of making corrections with a word processing system. Discuss ways in which word processing is easier than paper and pencil correction. Discuss the creative benefits of word processing.

-Use a word processor to develop stories which have "story starters." (Note: teachers may want these "starters" saved on diskette. Example: I was awakened from a deep and restful sleep by a sudden loud noise. I sprang from by bed to discover that I was no longer in my warm, cozy bedroom. Trying to get my bearings, I looked around and found that I was surrounded by nothing but water. Just as I leaned over the foot of my bed.....)

-Provide copies of the school lunch menus to all classrooms. Use the word processor to make date changes, group menus in different arrangements, and make changes in menu composition.

-Develop a class newspaper using the word processor. Small groups of students should be responsible for various columns in the paper. The class may want to elect regular editors for features and combine class efforts to create a school-wide publication.

-Write love letters for Valentine's Day using the word processor. You may want to have several forms and insert names at various places in each letter.

-Write fan club letters to rock groups using the word processor.

-Use word processing skills to develop customized holiday greeting cards.

-Build up classroom catalog files by writing letters to computer companies requesting catalogs. Use the word processor to draft the letters.

-Prepare weekly bulletins or other memoranda to parents on the word processor.

-Submit stories written on a word processor for inclusion in a class literary anthology.

-Suppose you are a candidate for mayor. Since you are extremely busy, you decide to use the computer to print "thank you" letters to 10 people who have contributed money to your election campaign. In your letter, mention the person's name as well as the amount he/she contributed. (Use your word processor's search and replace functions)

Data filing system:

-Using the manual or interactive tutorial for your data filing system, identify the process for designing a file, modifying a file, entering data into your file, editing your file, and retrieving information from your file.

-Using the manual for your data filing system, identify the processes for accomplishing the tasks listed below. Create an easy reference display chart or put this information in a large notebook.

-creating a structure for the data
-inputting data into the structure
-saving data to a storage medium
-searching for specific data
-updating records
-printing records
-backing up data disks
-modifying the data structure

-Use a data-filing system to create databases for teachers. For example, the social studies teacher might need a database of states naming the state capital, population, major cities, etc.

-Create a data-filing system that will yield a list of all students in the class, their addresses, phone numbers, and birthdays. Each month, search the data base and print a list of all the "birthday folks" for that month.

-Create a data base to which weather data such as high and low temperature, air pressure, wind speeds, and rainfall amounts can be daily recorded. One source for this information is the daily newspaper. Frequently produce reports from this data base, looking for trends and relationships.

-Modify the class data base to include favorite student hobbies, music groups, and foods. Search the data base and print a list of all students who have similar interests.

-Create a database to list all games played by school athletic teams, the scores on each game, and the vital statistics for each game. Invite the coaches to class for a demonstration and discuss ways in which the data could be searched and printed.

-Print labels from a data file for use in mailing letters developed through word processing. Use a data filing system to keep track of your distribution lists.

-Offer to assist various teachers with some of the record-keeping required in their work. For example, the Honor Society sponsor may need a data base of students making the honor roll each six weeks, the number of A's and B's made, etc.

Electronic spreadsheet:

-Use the manual or interactive tutorial for your spreadsheet program. Practice cursor movement, entering formulas, amounts, and labels.

-Using the manual for your spreadsheet program, identify the processes for performing the tasks listed below. Display this information on a chart or in a large notebook for easy reference.

- -moving the cursor
- -inputting labels
- -inputting values
- -inputting formulas
- -saving a worksheet
- -replicating formulas
- -using simple functions
- -printing worksheets

-Set up a spreadsheet to keep track of earnings from allowances and jobs (babysitting, mowing lawns, etc.) and of expenses incurred (entertainment, school supplies, etc.). Print out a report of one week's earnings and expenses. (Teachers may want to have fictitious data available for this and other activities)

-Keep track of your earnings and expenses using pencil and paper for two weeks. Compare this form of record keeping with using an electronic spreadsheet.

-Use an electronic spreadsheet to design a template for computing grade averages. Share your template with some of your teachers.

-Use an electronic spreadsheet to develop a template for balancing a checkbook. Demonstrate the use of this template to your classmates.

-Suppose you were the manager of the local "FASTBURGER" restaurant. Explain how you might use an electronic spreadsheet to keep track of your expenses and revenue. How could you use this system to track employee hourly schedules and wages or needed inventories of food and equipment? Choose one of these applications and create a template with sample inputs.

Graphics tablet or utilities:

-Using the manual which accompanies your graphics tablet or graphics utility program, identify the processes for performing the tasks listed below. Display your findings for quick reference on a chart or in a large notebook.

- -moving the cursor
- -drawing freehand
- -using fonts, icons, or graphics symbols
- -filling shapes
- -storing pictures on disk
- -retrieving pictures
- -modifying pictures

-Demonstrate the use of a graphics tablet for making computer-assisted designs. Post designs on the bulletin board. (For example, create a floor plan, design signs, develop posters.)

-Use graphics utilities to make drawings appropriate for different holidays (masks for halloween, turkeys for Thanksgiving, shamrocks for St. Patrick's Day, etc.).

-Develop cards for special days (birthday cards for teachers or students, mother's day cards, invitations to open house, Christmas cards for parents and staff, etc.).

-Make transparencies needed by teachers. Vary the size of the lettering and add designs where appropriate. Use graphics utilities, a graphics tablet, or a word processing system for this activity.

-Use a graphics tablet or utility to create designs for school pep assembly signs or school spirit ribbons.

Use a graphics tablet and/or a word processing system to create announcements for various school activities. (i.e., school plays, band concerts, choir performances, PTA meetings)

-Have a contest for the design and development of a school emblem. Use your graphics tablet or utility programs.

-Design a letterhead for your school stationery. Submit these designs to your school principal.

-Design a masthead for your school newspaper or class newsletter. If several students are interested in this activity, hold a contest and have the editors of the newspaper choose a winner.

-List other ways in which a graphics tablet or graphics utilities could be used in your school. Make a list of class projects for some of these activities.

OBJECTIVE D: DEMONSTRATE ABILITY TO REVIEW AND EVALUATE COMMERCIAL SOFTWARE FOR EFFECTIVENESS AND EASE OF USE

-Develop guidelines for evaluating software. Students should work in groups and compare their sets of evaluation criteria. Post the best forms on the bulletin board.

-Use student-developed evaluation suggestions to look at a software package in a large group. Discuss the software in the context of the evaluation considerations. List ways in which the software could be improved.

-Write and present a television commercial recommending a particular software package. Give your reasons for favoring this product.

-Read several reviews of software programs in one area (space games, for example). Summarize your findings in a report.

-Demonstrate software you consider to be of poor quality, pointing out its limitations and giving suggestions for ways it could be improved.

-Create a notebook of software reviews. Students may be encouraged to bring some software from home for review. Submit these reviews to computer journals for possible publication. (Note: See Student Journal reference section in this document.)

-Develop a chart entitled "Software for Home Computers." Interview people who own home computers to see what types of software they use and list each on the chart.

-Using a form letter created on a word processing system. Write to numerous software vendors requesting their current catalogs or advertisements. Use these materials to create classroom files and bulletin boards.

-Visit a computer store and examine some applications software. List the kinds of tasks which can be done by each system.

-List features common to most word processing systems. Which "additional features" are also desirable? Why?

-Compare commands used in different word processors. Use the word processor you like best to write a report giving your reasons.

-Examine software reviews from professional journals and newspapers.

OBJECTIVE E: IDENTIFY THE KINDS OF APPLICATIONS SOFTWARE APPROPRIATE FOR GIVEN TASKS.

-Make a list of several tasks which might be done with computer assistance. Describe the software which might be used for each job. Using classroom software or software catalogs, list the software appropriate for each task. Which software could be used for several applications?

-Suppose you are the owner of a new audio/video store which specializes in records, tapes, and musical video tapes. List the kinds of tasks you might need to do as manager. Which of those tasks could be done with computer assistance? List the software you would use. Give clear reasons for your choice.

-Interview friends or neighbors who own home computers. Ask questions about the software they use. How did they decide to purchase the software they are currently using? What are the most common applications?

-Predict which kinds of tasks will likely be done by computers in the year 2000. What tasks will probably not be done by computers in the future? Why?

OBJECTIVE F: DEMONSTRATE SKILLS FOR DATA ENTRY AND ERROR CHECKING IN THE CONTEXT OF APPLICATION PACKAGES SUCH AS DATA FILING SYSTEMS.

-Discuss skills necessary for accurate and efficient data entry, such as maintaining consistent format, organizing data, correcting errors, and making back-up copies of data disks.

-Practice these skills by developing and maintaining several data files. (See data-filing systems activities)

STUDENT ACTIVITIES
ELEMENT FOUR
Communicating Instructions to the Computer

OBJECTIVE A: USE AND DEVELOP FLOWCHARTS AND TOP-DOWN DESIGN AS A MEANS OF EXPRESSINGS ALGORITHMS

-Define "computer program." Discuss the need for clear, understandable directions in communicating to computers.

-Work in small groups to develop a process for sharpening a pencil. Pretend you have a robot which only understands a few primitive keywords. Write those keywords on the chalkboard. Write a set of instructions for the robot to follow.

-Write instructions for programming a robot to do simple household chores. Work with a partner. One student develops the instructions and another student follows them as if he were the robot.

-Write a set of instructions for making a peanut butter and jelly sandwich. Choose one set of directions for a selected student to follow. Discuss the problems or ambiguities in the directions and re-write so they are more clearly stated.

-Make a bulletin board display of standard flowchart symbols. Discuss the purposes of flowcharting and the reasons for standard symbols.

-Make a bulletin board display of a top-down design (stepwise refinement) chart or outline for taking a bath. (Note: See the section on programming methodology in this document.) Discuss ways in which this technique for organizing the solution of a problem differs from flowcharting.

-Use either flowcharting symbols or stepwise refinement charts to describe the following processes (algorithms). Students and teachers should note that there is more than one correct representation for each process.

-Making a batch of cookies
-Building a fire
-Checking out a library book
-Loading a diskette into the computer
-Placing a phone call
-Planting a garden
-Building a model car
-Planting a tree
-Washing a dog
-Cleaning your house
-Mowing the yard
-Framing a picture
-Making a paper airplane
-Wrapping a Christmas present
-Planning a vacation
-Building a table
-Getting ready for school

OBJECTIVE B: LEARN THE SYNTAX OF A HIGH LEVEL LANGUAGE.

(BASIC examples will be given. Other languages such as LOGO or Pascal would also be appropriate. In the BASIC examples, generic statements are used. However, it should be noted that capabilities of machines differ. For example, some computers will not support lower case.)

-Each student should make an egg carton computer. (See "Teacher Made Materials" section of this document.) This device can be used each time a new keyword or concept is introduced.

Constants, variables, and operations:

-Make a bulletin board display or overhead transparencies which list valid forms for constants, variables, and operation symbols used in standard BASIC. Discuss these valid forms and show examples of invalid forms. (For example, -5 is a valid constant, but $5 is not.)

-Using the overhead or chalkboard, display a simple BASIC program. Identify constants, variables, operation symbols, and BASIC keywords.

-Key in the following statements listed below. RUN the program, explain the purpose of each operation symbol, and give the result of each PRINT statement.

```
10 PRINT 100 + 400
20 PRINT 9 * 3
30 PRINT 50/2
40 PRINT 6 - 4
```

-Demonstrate how each of these calculations can be made in the immediate mode.

-Make a bulletin board or chart display of the operation symbols used in BASIC. Practice translating simple math expressions into valid BASIC expressions.

-Write a program to do the following:

Add 6 plus 12
Subtract 4 from 15
Multiply 2 and 9
Divide 18 by 6

-Differentiate between BASIC commands (such as RUN, LIST, NEW) and BASIC statements (LET, INPUT, PRINT, etc.). Explain how commands and statements differ. (For example, commands are not numbered and are used in the immediate mode. Statements are a part of the program, and are therefore numbered.)

The PRINT statement:

-Review various formats for the PRINT statement in expressing strings and constants. Describe the output which these lines of BASIC would generate.

```
10 PRINT 13 + 24
20 PRINT "13 + 24"
30 PRINT "Hello"
40 PRINT "This is great fun!!!"
```

-Write a program which will print your name on the first line, the name of the teacher on the second line, and the name of the school on the third line. Modify this program so that it prints your name, address, and phone number.

-Describe the effect of using commas and semicolons with the PRINT statement. How does the output of these two program lines differ?

```
10  PRINT  "Hello ";"there"
20  PRINT  "Hello ","there"
```

The LET statement:

-Explain the format for variable assignment using the LET statement. (LET followed by a variable, followed by an equal symbol, followed by a constant or expression). Why is the following format unacceptable?

```
10  LET  8 + 2 = A
```

-How is the output generated from the following programs different?

```
10  LET A = 2              10  LET  A = 2
20  LET B = 5              20  LET  B = 5
30  PRINT  "A","B"         30  PRINT A,B
```

STRINGS:

-Discuss string variables. How do string variables differ from numeric variables? What kinds of information can each store?

-Key this program into your computer. What output does it generate when you RUN the program?

```
10  LET A$ = "GO"
20  LET B$ = "TEAM"
30  LET C$ = "GO"
40  PRINT A$, B$, C$
```

-Modify the above program so that its output is

```
I LOVE LUCY!
```

The INPUT statement:

-Key in the following program. What does it do? (Prints the sum of 3,4, and 5.)

```
10 LET A = 3
20 LET B = 4
30 LET C = 5
40 LET S = A + B + C
50 PRINT S
```

-This program will print the sum of any three numbers. Explain how the INPUT statement makes this possible. Why is this program more powerful and useful than the one above?

```
10 PRINT "I can add any numbers."
20 PRINT "Type the first number."
30 INPUT A
40 PRINT "Type the second number."
50 INPUT B
60 PRINT "Type the third number."
70 INPUT C
80 PRINT "The sum is.... ";A + B + C
```

-Key in this program. What does it do?

```
10 PRINT "What is your name";
20 INPUT N$
30 PRINT N$; " is terrific!!!"
```

-Run this program several times and explain how the INPUT statement can cause the output to be different each time.

```
10 PRINT "What is your name";
20 INPUT N$
30 PRINT "Name an object you have at school";
40 INPUT S$
50 PRINT "What do you like for lunch";
60 INPUT  L$
70 PRINT N$; "! Get your  ";S$;"out of your ";L$;"."
```

-Using INPUT statements, write a program which will generate a "Mad Lib." User responses are stored in strings, and then inserted a various places in a "silly story." The program should ask the user to answer questions such as the following:

-What is your favorite color?
-Name an adjective which describes size.

-How old are you?
-What is your favorite food?

-Using INPUT statements, write a program which will compute and print the average of a set of 5 numbers.

-Write a program which will ask the user the length and width of a room and then compute and print the area.

-Key in this program and RUN it. Discuss this use of the INPUT statement as a way to make the program work for any word the user types in.

```
10  REM Program to convert English words
20  REM to "pig Latin."
30  PRINT "Type a word."
40  INPUT W$
50  PRINT W$; "in pig Latin is "
60  PRINT MID$(W$,2) LEFT$(W$,1) "AY"
70  END
```

(Extension activity: Modify this program so that it will convert a whole sentence from standard English to "pig Latin.")

<u>The GOTO statement:</u>

-Key in this program. What does it do? (Use your reference manual to determine how to stop or "break" an infinite loop.)

```
10 PRINT "The computer is going crazy!!!!"
20 GOTO 10
```

-Use a GOTO statement to write a program to print your name many times on the screen.

-Write a program which will print "I love ET" over and over again.

-Explain how the output of these two programs is different.

```
10  PRINT "Wow !!!"            10 PRINT "Wow!!!";
20 GOTO 10                     20 GOTO 10
```

-Write programs which will

- -Print HI in a column down the left side of the screen.
- -Print HI all over the screen.
- -Print rows of stars all over the screen using only one star in your program.
- -Print a picture of a rocket, robot, or car using symbols such as -,+,=,*.

<u>The IF/THEN statement</u>:

-Discuss the relational symbols in BASIC. (<, >, =, <=, >=, and <>.) Practice using these symbols by converting these conditional statements in English to conditional statements which use these symbols.

X is equal to Y
A is less than B
R is greater than or equal to S
5 is not equal to 3

-Illustrate the IF/THEN statement by discussing and executing the following programs.

```
10  PRINT "Which would you like, a daisy or a dandelion";
20  INPUT F$
30  IF F$ = "daisy"  THEN PRINT "You picked a flower."
40  IF F$ = "dandelion" THEN PRINT "You picked a weed."
50  END
```

```
10  REM Fortune telling program
20  PRINT "Type a 1,2, or 3 and press return."
30  INPUT X
40  IF X = 1 THEN PRINT "You will be famous!"
50  IF X = 2 THEN PRINT "You will be rich!"
60  IF X = 3 THEN PRINT "You will have 10 children!"
```

(Extension activity: Re-write this program so that it displays different fortunes.)

```
 5  REM Simple quiz
10  PRINT "How many states are in the U.S. ";
20  INPUT S
30  IF S = 50 THEN 60
40  PRINT "NO. Try again."
50  GOTO 10
60  PRINT  "That's oh so right!!!!"
```

(Extension Activity: Write a similar quiz on another topic.)

```
10  REM Homework reminder
20 PRINT "Did you do you homework?"
30 PRINT "(Type Y or N)";
40 INPUT R$
50 IF R$ = "Y" THEN PRINT "Good for you !!!" : GOTO 90
60 IF R$ = "N" THEN PRINT "Better get crackin' !!": GOTO 90
70 PRINT "Type Y or N, please."
80 GOTO 40
90 END
```

(Extension activity: Rewrite this program with different responses for homework done or not done. If homework is not done, generate a list of study hints.)

-Write a program which will list 10 patients for a doctor by name and account number if they owe a balance of $500 or more.

-Write a program in which two players play a guessing game. The first player inputs a number which the second player attempts to guess. The program should provide prompts to the student, such as "too high", "too low", "you got it!!".

> Extension: Modify this program so that a single player can play the computer. This means that the computer picks a random number for the person to guess. Look in your computer manual or text to determine how to generate a random integer. Most forms of BASIC use one of the following methods to generate a random integer between 1 and 10,
>
> X = RND(10)   or   X = INT (10*RND(1) + 1)

-Write a program which asks for the user's age. If the person is 16 or older, the program will respond by printing "You can legally drive a car. Congratulations!" If the user is under 16, indicate to the user how many years he/she will have to wait before being able to drive.

-Write a program which asks for the user's weight. Then ask the user what he/she would like to weigh. Compare the 2 weights. If the user weighs more than desired, list a few weight-losing tips. If the user weighs less than desired, tell the user to go on an eating binge. If the user's weight is the same as the desired weight, congratulate him/her.

The FOR/NEXT Statement:

-Suppose you wanted to write a program to count from 1 to 1000. Using the BASIC keywords you have learned so far, how many lines would such a program require? Key in this program and observe the output. Notice that this program performs the task in only 3 lines.

```
10 FOR J = 1 TO 1000
20    PRINT J
30 NEXT J
```

-Key in this program and demonstrate its execution. How can the FOR/NEXT loop be used to print something several times?

```
10 FOR I = 1 TO 10
20       PRINT "Hi there, cutie!"
30 NEXT I
```

Now modify this program so that it prints your name 15 times.

-Compare these two programs and discuss the way the "loop limit" (the number of times the loop executes) is determined.

```
10 FOR I = 1 TO 10
20    PRINT "I am neat!"
30 NEXT I
```

```
10 PRINT "Type a number"
20 INPUT N
30 FOR I = 1 TO N
40       PRINT "I am neat!"
50 NEXT I
```

-Write a program which will ask the user how many times he/she wants to say "Computer literacy is fun!!" then print that sentence the desired number of times.

(Extension activitity: Have the user also input the particular sentence he/she wants printed several times. Remember to store the sentence in a string variable.)

-Demonstrate this program's execution. What does the STEP 2 do to the output?

```
10 FOR I = 1 TO 11 STEP 2
20      PRINT I
30 NEXT I
```

-Now look at this program. Describe the purpose of STEP -1.

```
10 FOR I = 10 TO 0 STEP -1
20      PRINT I
30 NEXT I
40 PRINT ".....Blast off!!!!!"
```

-What output will be generated by the following programs?

```
10 FOR X = 3 TO 9
20    PRINT X
30 NEXT X
-----------------------------------------------------------

10 FOR Y = 5 TO 25 STEP 5
20     PRINT Y
30 NEXT Y
-----------------------------------------------------------

10 FOR A = 100 TO 10 STEP -10
20     PRINT A
30 NEXT A
```

-Write programs which will count

-from 1 to 15
-from 2 to 20 by twos
-from 1 to 15 using odd numbers only
-from 3 to 99 by multiples of three
-from any number to any other number, based on user input
(hint: Use INPUT statement)

-Write programs which will print
-I AM WONDERFUL 25 times
-I AM A SUPER PROGRAMMER 50 times
-your name 100 times.

-Have the computer store a message you have created in a string variable. Print that message 20 times with counting numbers 1 to 20 beside each repetition of the message.

-Write a program to find the sum of all the odd numbers from 13 to 147.

-Use a FOR/NEXT loop to print your name in a zig-zag pattern from one side of the screen to the other and back again. (Experiment with different symbols and spacing to create interesting effects.)

-Use symbols such as +, =, -, <, >, ?, /, #, $, *, to create interesting designs by printing them in various combinations using a FOR/NEXT loop. Print these designs on paper and display them on the bulletin board.

Nested loops: (Extension activity only)

-Discuss the concept of nested loops by discussing the "monkey in a barrel game" children sometimes play, in which each barrel is contained by the next larger barrel, and a monkey is in the smallest one.

-Use egg carton computers to trace the execution of the following program. (See "Teacher Made Materials" in this document.)

```
10 FOR I = 1 TO 3
20    FOR J = 2 TO 6 STEP 2
30       PRINT J
40    NEXT J
50 NEXT I
60 END
```

-What would be the output of this program?

```
10 PRINT "This is a computer."
20 FOR K = 1 TO 4
30    PRINT "Nothing can go "
40    FOR J = 1 TO 3
50       PRINT "Wrong!"
60    NEXT J
70 NEXT K
80 END
```

-Using only two PRINT statements and nested loops, write a program to print a triangle that is three lines high and four columns wide.

<u>The READ/DATA statements</u>:

-Discuss the ways numbers and words are stored in variable addresses and how the BASIC statements LET and INPUT accomplish this. RUN these programs and discuss the READ/DATA statements.

```
10 READ N
20 IF N = 0 THEN END
30 PRINT N
40 GOTO 10
50 DATA 1,3,5,0
-------------------------------------------------------------
```

```
10 READ G$
20 IF G$ = "STOP" THEN END
30 PRINT G$
40 GOTO 10
50 DATA "BIKE", "CAR", "SKATES", "STOP"
```

-Type the program. Complete it by replacing the ? with five of your favorite foods.

```
10 FOR X = 1 TO 5
20 READ N$
30 PRINT " I LIKE ";N$
40 NEXT X
50 DATA ?,?,?,?,?
```

-Use DATA statements to write the names of four of your friends, something they like, and something they dislike. For example, if Sue likes strawberries and dislikes cheese, the data statement would include

```
DATA "Sue", "strawberries","cheese"
```

Now write a program to print a line for each friend which indicates their likes and dislikes. For example,

```
Sue likes strawberries and dislikes cheese.
```

-At the GOODIE PIE SHOP, Mary bakes 50 pies per day, Janet bakes 35, Sue bakes 17, Ann bakes 48, and Ellen bakes 22. The shop needs to cut back some of its staff due to financial problems. Using READ, DATA, and a loop, write a program which will print dismissal notices to employees who bake fewer than 30 pies per day.

-Grown-up animals are often known by different names than baby animals. A baby dog is a puppy; a baby cat is a kitten; and a baby chicken is a chick. Using READ and DATA, have the computer tell you the name for a particular baby animal.

-Use DATA statements to create a list of adjectives and nouns which could be used to generate a list of similes. For example, SLOW as a TURTLE is a simile, with SLOW the adjective and TURTLE the noun. Using READ, DATA, and PRINT, list at least seven similes.

-Using READ and DATA, generate names for musical groups. For example, you might combine adjectives, colors, and animals, resulting in such names as ROCKING YELLOW RABBITS.

Subroutines:

-Key in the program which recommends proper clothing for given weather conditions found in the "Programming methodology" section of this document. Discuss the use of GOSUB and RETURN and the program control and organization accomplished by these statements.

-As a class, discuss some of the programs you have written in this course. Would some of those programs be enhanced with the addition of certain graphics? If so, work in groups to develop some graphics subroutines. Share your subroutines and practice using them in programs you have written.

-Bob has a hard time keeping track of his money. Write a program which will accept his weekly earnings as input and print the total based on that input.

-Discuss the "make your own adventure" type books, in which you are directed to branch to certain pages based on your answer to questions at given times in the story. Using PRINT statements, IF/THEN statements, and GOSUB/RETURN, write a simple "make your own adventure" story. Share subroutines with classmates to write more complex adventures.

-Subroutines are often used when a given task must be performed several times. This sometimes happens in programs which generate computer graphics. Using symbols such as +,-,?,*,#,%, and !, (or the graphics mode of your computer), write subroutines which will generate circles, squares, rectangles, and triangles of varying sizes. Call these subroutines with a main program to design pictures of such things as houses, boats, cars, rockets, etc.

OBJECTIVE C: DEVELOP PROBLEM-SOLVING SKILLS

-Discuss the problem-solving cycle.

- -analyze the problem
- -develop the algorithm
- -code the program
- -execute the program
- -test the program
- -make any needed corrections
- -document the program

-In group instruction, use the problem solving cycle to develop a solution to the following problem.

> Suppose Texas has a five per cent sales tax. Write a program that will allow you to INPUT names and prices of items found in a store and then print the name of the item, the tax, and the final cost of the item with the tax.

PROBLEM-SOLVING CYCLE:

Analyze the problem: What information is given in this problem? What information is asked for? Is there information here which is irrelevant to a solution? What information is assumed?

Develop the algorithm: Use a step-wise refinement chart to design a possible solution to the problem. (See the "Programming Methodology" section of this document for step-wise refinement technique.)

Code the program: Write a subroutine for each step of the solution.

Execute the program: Key your program into the computer and RUN it.

Test the program: Try out your program by inputting reasonable products and prices. If the output does not seem accurate, make necessary corrections. Now try the program by inputting very large and very small numbers. What happens when you input a zero? Correct any mistakes you find. (Good programs work correctly even with unexpected input.)

Document the program: Be certain that your final program has sufficient internal documentation using REM statements. Variables should be declared at the beginning of the program. An overview of the solution should be included as well. Each subroutine should begin with a REM statement which describes its purpose. On paper, briefly describe your program and how it works. Include instructions for the user.

OBJECTIVE D: WRITE REASONABLY STRUCTURED PROGRAMS (MODULAR IN NATURE).

Use structured programming techniques to solve the following.

Develop a code of your own and devise a program to decode messages written in that code. Test the program by having a friend use your code to encode a message to you without your seeing it. The program should decode the message correctly.

Write a "teaching program" in which the computer provides practice problems to a student to determine knowledge of the rules for adding and subtracting whole numbers. Give positive feedback for correct answers and have the student try again after a miss.

Write a program which will display your name five centimeters high.

A pizza has about 375 calories. Jogging one mile will consume about 100 calories. Write a program that will tell you how many miles you must run to burn up the calories you consumed by eating different amounts of pizza.

Susie has fruit (bananas, strawberries, oranges), two cereals (cornflakes and oats), two types of eggs (scrambled and hard boiled), and two meats (sausage and bacon) which she likes for breakfast. Print out a list of 10 possible combinations of the foods she can eat.

Write a program for a doctor which will list 15 patients by name and account number. Have the program list all patients who owe $500 or more.

Write a program which will allow you to order a special hamburger and compute the cost. Indicate the ingredients you like, and adjust the price to those you select. For example, the basic hamburger might cost $2.50, with bacon adding 59 cents to the cost, cheese adding 25 cents, and double meat adding 90 cents. Your program should print a description of the hamburger you have ordered, as well as the total cost.

Write a program which will simulate the tossing of a coin 15 times. Use the RND function and keep track of the number of times that heads or tails were tossed.

Write a program which will simulate the rolling of a die. Keep track of how many times each number is displayed after 30 rolls.

Look through your math book. Identify problems for which you could write a BASIC program as a solution.

Write a program which will keep track of your grade average in computer class. If you enter your current number of grades, have three subroutines which will average daily grades, test grades, and homework grades.

The LAZY TRAVELER LODGE has 10 rooms. Write a program which will print a label for each room indicating the room number. Include a graphic design for each room.

Your little brother has a piggy bank containing 11 cents. Each day, he adds pennies to the bank. Write a program which will ask how many pennies have been added, and then print the value of the bank's contents after each addition.

Create "silly sentences" by having the computer print the words of a given sentence in reverse order.

Create a flashing sign on the computer which will advertise a special on SUPER-DUPER ICE CREAM SUNDAES for only 59 cents.

Find the average of four grades for each of five students. The output should include the students' names, a list of all the grades, and the final average for each student.

If Michael has 3 shirts (red, yellow, green), 4 pairs of pants (black, blue, purple, orange), and 2 sweaters (white and green), print a list of all possible combinations of the articles he can wear.

EXTENSION PROGRAMMING ACTIVITIES:

A sheet of paper is five tenths millimeter thick. A stack of paper was started by laying down two sheets. The next addition to the stack was double the first, or four sheets. The third addition was double the second, or eight sheets. The third addition was double the second, or 16 sheets. If this continued until 32 additions had been made, how high would the stack be? Write a BASIC program to determine the answer.

Use the RND function and strings to generate a four-word silly sentence.

Using string functions, write a program to play a word guessing game. Have a player guess a secret word. Search each word guessed to identify any letters which are also contained in the secret word. If the user guesses any correct letters, list them. If the entire word is guessed, type "That's it!!"

Design a questionnaire to be administered to your fellow students and a computer program to compile and analyze the results. Your questionnaire might ask questions about a political election, favorite foods, attitudes about computers, or future career plans.

Write a program which will convert any whole number between one and 3000 into its correct Roman numeral equivalent.

Write a program which will produce palindromic words or phrases, such as

Madam, I'm Adam
Too hot to hoot
Rise to vote, sir
Was it a rat I saw

If we started with one newborn pair of rabbits, how many pairs would there be at the end of a year, assuming that every pair produces another pair every month and that rabbits begin to bear two months after their own birth? Write a BASIC program to answer this question.

Theodore Thrifty opens a savings account. Each day, he deposits twice the amount of the previous day. He puts one dollar in the bank on day one, two dollars on day two, four dollars on the next day, etc. Determine the amount of money he has in the bank at the end of 18 days.

A ball is dropped from a height of 10 meters. It rebounds one-half the distance on each bounce. What is the total distance it travels, if the ball stops bouncing when it hits the ground for the 100th time?

Pretend you find some coins on the street. Randomly generate the number of nickels, dimes, and quarters you find. Have the program compute the value of the change you have found.

Assume that you sleep an average of 8 hours per day. Write a program which will accept as input your birthday in numeric form (ie., 7,15,71) and compute the number of hours of your life which you have spent sleeping. Use 365 days in each year and 30 days in a month.

The area of a triangle can be found by multiplying one-half times the length of the base times the length of the altitude. Write a program which allows the user to input the base and altitude of any triangle. The program should compute and print the area.

Write a program which will convert base ten (decimal) numbers into base two (binary) numbers. Why is base two numeration important in computing?

STUDENT ACTIVITIES
ELEMENT FIVE:

Computer Use in the Society

OBJECTIVE A: IDENTIFY COMPUTER-RELATED CAREERS, INCLUDING TRAINING REQUIREMENTS

-Contact employment agencies, colleges and universities to determine the computer-related skills most in demand. Investigate the job descriptions, the average salary, and the courses or degrees required. Post the information on a bulletin board, along with advertisements, articles, want ads, or other related information. Students may want to use a data filing system to create a file of this kind of information.

-Examine copies of programmer aptitude tests from Computer Learning Center, Washington, DC or vocational education tests that measure computer skills. Discuss the skills that are required in computer-related jobs--logical thinking, attention to detail, some knowledge of mathematics, typing, etc.

-Interview a person in a computer-related career. Ask the person to describe major job responsibilities, a typical day, and the best-liked and least-liked aspects of the work.

-Write to computer hardware manufacturers requesting information about their products, services, and career opportunities.

-Scan the want ads in the local newspaper and in computer periodicals for jobs offered and the qualifications sought. Post on the classroom bulletin board.

-Contact your local state employment agency for information concerning job opportunities and career planning. Which jobs require some computer skills or experience? Describe the kinds of computer skills required. Discuss the difference between data entry skills and programming skills.

-Write to a computer software development company to find out about the types of skills needed for employment.

-Ask a local job placement center about the most commonly available computer-related jobs. Write a report on the jobs, including salary range and educational requirements.

OBJECTIVE B: DESCRIBE THE IMPACT OF AUTOMATION ON THE JOB MARKET

-Work in groups to develop three collages: one depicting people whose jobs might be accomplished by computers, one depicting people working with computers, and one dipicting people doing jobs that only human beings can do.

-Interview career counselors, computer specialists, math/computer teachers, or other persons in computer-related occupations to determine the impact of computers on their jobs.

-Place yourself in the position of "boss" in a particular occupational field. List five factors in priority order that you would consider in deciding whether to have computers or people complete certain tasks.

-Interview psychologists, American Civil Liberties Union members, sociologists, computer programmers, businesspersons, and teachers to determine their views about how computers will impact their fields. Students may also wish to interview a parent or community member to discover the current and projected impact of automation on various fields.

-Make a three-column chart, each headed by the name of a course you are taking. In each column, write the effects that computers have had on the field and on the course itself. (For example, English classes often use word processing, and the field of professional writing has been dramatically impacted by this technology.)

-List several career fields of interest to you. Tell the effects that computers have, or will have, on each of them.

-Many people oppose automation because they think it results in increased unemployment. Report on how the growth of the computer industry has affected employment. Discuss jobs lost to automation, jobs created by automation, the quality of jobs lost and gained, how jobs outside the computer industry have been affected, future trends, and the impact on your career choices.

-Research the use of robots in industry. What types of jobs do they do? How much do they cost in comparison to what human factory workers cost employers per hour? How are robots used to enhance safety in a factory? Locate an article or book about robotics. How will robots probably be used in business and industry in the future?

-Make a list of jobs that have disappeared because of automation. Choose a menial job that you think will be eliminated from the job market in the near future and discuss how a technical tool might do the same work.

OBJECTIVE C: IDENTIFY THE IMPORTANCE OF ETHICS IN ACCESSING AND MANIPULATING AUTOMATED INFORMATION

-Draft some guidelines to control the use of any data bank containing personal information. Consider who can use the information and who can change the information. Discuss the guidelines in class.

-Debate the positive and the negative aspects of computer use in various areas of the society. Examples might be computer use in medicine, law enforcement, psychology, and education. Use articles, real-life situations, and other resources to support your arguments.

-Write skits to illustrate both positive and negative computer-related social issues.

-Write an essay on a computer-related social issue. Topics might include dehumanization, technological culture shock, the computer generation, minority disadvanteges in a computerized society, the computer revolution, privacy, instant democracy (computerized voting and poll taking), automation, and advantages for the handicapped.

-Ask several adults about the databases that contain personal information (Ex.: social security, census, Internal Revenue, motor vehicle registration, library, etc.). How is this information used? How might it be abused? What safeguards could or should be established to guard against such abuse?

-Develop a questionnaire to acquire information about another person. Sample questions might be: "What is your name?", "Who are your parents?", "Where do you live?" , "How much money does your family have in the bank?" Trade questionnaires with other class members and answer only those questions you feel comfortable answering. As a class, discuss why certain questions were not answered. Then discuss the issue of privacy and how to protect individual rights to privacy.

-List all the places that contain personal information (school or medical records, for example). What information is in these records and who has access to them? How would you feel if anyone who wanted to see those records had access to them?

-Discuss the threat of automated data bases to privacy and freedom. What kinds of information does a typical personnel or credit reference data base contain? How does automation make this data more readily available to people than a paper file of such information?

-Keep a record of everything you buy in a week. Discuss building a class data base using this information from all students. Would it bother you if others could have access to this information? Is there any personal information you would not like to open for all to see?

-Discuss building a student data base for the class. What kind of information could be in it -- phone numbers, addresses, grades, size of allowance? What kinds of data should not be in the data base?

OBJECTIVE D: IDENTIFY THE ISSUES AND POTENTIAL SOLUTIONS PERTAINING TO COMPUTER-RELATED LAW, COPYRIGHT, PRIVACY, AND COMPUTER CRIME.

-Clip newspaper stories on computer crimes to post on the bulletin board. Identify the types of crimes associated with computers.

-Read articles about the development of safeguards, such as number codes or copy locks, to prevent particular types of computer crimes. Write a paper describing the safeguard and how it works.

-Discuss the movie, "War Games," in which the main character attempts to impress his girlfriend by entering the school's data bank and changing her biology grade from an "F" to an "A". Did he or did he not commit a crime?

-Interview a lawyer to learn about computer-related laws. Ask about the role of computers in such laws as the Freedom of Information Act of 1966-67, the Fair Credit Reporting Act of 1970, and the Privacy Act of 1970.

-Write a summary of a computer crime that you have read or heard about. Explain how the computer was involved, whether the crime could have been committed without it, and the punishment the criminal received.

-Describe the possible problems that could result from computerized information files on private citizens. Are such files beneficial or harmful when used for law enforcement purposes?

-List the legal problems that could result from a medical information bank.

-Report on a case where services were stolen from a computer center. Explain how the theft was discovered, if the thief was caught, how he was caught, and if the case was prosecuted. How likely is it that computer thefts are discovered and the thieves are caught? How can these thefts be prevented?

-Discuss the issues involved in copying programs without the permission of the programmer. Discuss this problem in terms of the amount of time involved in writing a computer program, the expense associated with development, and the cost of computer software.

-Write an essay on "Difficulties in Preventing Computer Crime" or "The Impact of Computer Crimes on the Economy."

-Discuss the difference between a felony, a misdemeanor, and a question of ethics as they relate to computer crimes or computer abuse. Discuss several kinds of computer abuse and categorize each as one of these three types.

-Discuss Isaac Asimov's three laws of robotics. How accurate do you think his laws are? Write your own laws of robotics.

-Check your school library for computer-related stories. Read one and discuss in class.

"Maxon's Master," by Ambrose Bierce
"I, Robot," by Isaac Asimov
"Who Can Replace Man, " by Brian W. Aldiss
"Men are Different, " by Alan Bloch

PROGRAMMING

METHODOLOGY

PROGRAMMING METHODOLOGY

Definitions:

The purpose of communicating instructions to the computer is to produce a program which will allow humans and computers to communicate effectively. To learn this skill, students need more than knowledge of programming language syntax. They must also learn good programming methodology. The goals of such methodology should be to produce programs which are easy to read, easy to de-bug, and easy to modify or extend. Good methodology involves good habits of design, problem solving, and good coding techniques. These experiences should help students develop good organizational skills for solving real world problems, not just those associated with computer programming.

"Top-down" design is a problem solving strategy in which the designer considers the whole problem, divides it into a few general sub-problems, and then as long as necessary continues to subdivide these sub-problems into more specific sub-problems. Because the initial problem is continually refined from high levels of generality to lower levels, the process is known as "stepwise refinement." The rationale is to take a large problem whose solution contains too many steps to easily consider at once, and break it into smaller, more manageable problems. Coding in a programming language does not begin until the design process is complete. The sub-problem solutions are often represented as independent modules in the coding process. The term "structured programming" is often used to refer to the design and coding techniques which result in a program which is modular in nature, and easy to read, de-bug, modify, and extend. In BASIC this modularity is accomplished with subroutines, each of which has a specific function in solving the programming problem. Structured programming produces modules which have only one input and one output, which results in an easy to follow program.

Why Structured Programming Is Important:

As the speed of modern computers continues to increase, and as their capacity to handle large programs increases as well, cost in data processing is no longer tied directly to CPU time or to storage.

Consequently, the primary cost of computing is associated with the personnel cost of software development, maintenance, and modification. Since this process is done by human beings, it is critically important that programs written be easy to read, understand, de-bug, and modify. Also, the bulk of programming is done by teams of people. This implies that a given person must be able to read and understand another person's program. Finally, independent modules which easily communicate their purpose can often be used in other programs with little revision.

There are also compelling educational reasons for teaching good programming methodology to students. There is some evidence that such techniques tend to improve students' overall problem-solving ability. That is, when students are involved in the development of modular, readable solutions to problems, they tend to be able to organize solutions, follow-through with logical approaches, and communicate solutions in a clear and readable fashion.

Programming Style:

There are numerous techniques of coding style which serve to make programs clearly communicate the function of each statement and module. It is important that the initial programmer and others be able to follow and understand program control. Such style techniques serve to facilitate program maintenance. While programming style is largely a matter of taste, the following recommendations might be made to students:

-Each program should begin with a REMark statement which describes an outline of the solution.

-All variables should be explained with REMark statements at the beginning of each program.

-Variable notation should be relevant to the values they represent (ie., use SM for sum or NA$ for name).

-Wherever possible, programs should be solved by using subroutines to develop modular solutions.

-Each subroutine should begin with a REMark statement which describes the purpose of that subroutine.

-Each subroutine can be delineated with a row of symbols (such as --- or ***) to separate it from the main program and from other subroutines.

-The RETURN for each subroutine should include a REMark statement which indicates the line number to which the program control is transferred (unless the subroutine is called from several locations).

-The body of FOR/NEXT loops should be indented (using colons if needed).

-When GOTO statements are used, they should be REMarked to indicate the result of that branch.

Teaching Examples: Top-down Design (off-line activity)

Many computer science teachers introduce top-down design by illustrating the design process for solving an everyday problem such as cooking or mowing the lawn. To demonstrate such an approach, a top-down design process for planning a bath follows.

The first process in step-wise refinement is to break the problem into several, more or less independent sub-problems. The problem, taking a bath, could be broken up into the following general steps:

1. Get the water ready
2. Get supplies ready
3. Take the bath
4. Finish up

These steps provide an outline for the first level. Then each of these sub-problems can be solved separately.

1. GET THE WATER READY
    1.1 Turn on faucet
    1.2 Adjust temperature
    1.3 Put in plug

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1.3 Put in plug
1.4 Turn off water

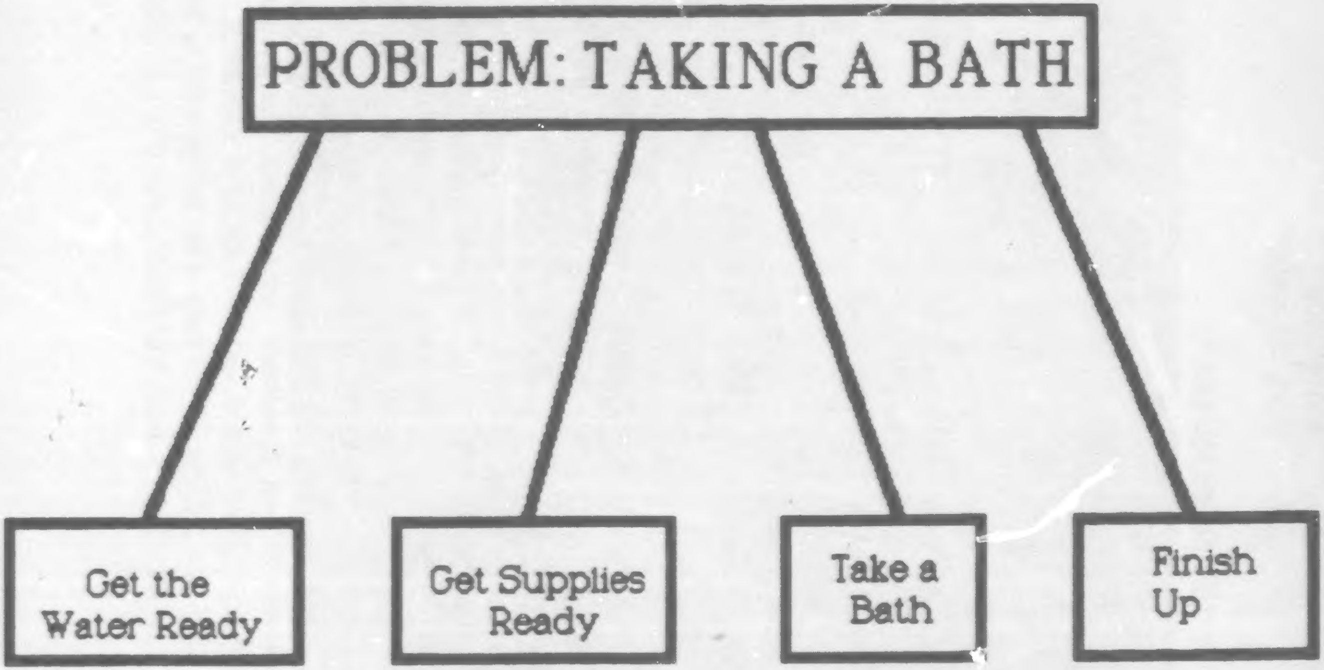
2. GET SUPPLIES READY
    2.1 Get a towel
    2.2 Get a washcloth
    2.3 Get a bar of soap

3. TAKE A BATH
    3.1 Get in tub
    3.2 Wash body
    3.3 Rinse body
    3.4 Get out

4. FINISH UP
    4.1 Dry body
    4.2 Pull plug

This can be called level two of the refinement process. If any of these sub-problems were non-trivial, they could be further refined until the sub-problems produced were manageable. Combining all the final sub-problems gives the complete design for a solution to the original problem, taking a bath. Splitting up a problem into sub-problems is a refinement process, and the successively more detailed outlines are the levels of refinement. This process is often called the "divide and conquer" method. The object is to put off details until the last. The process can transform a large, seemingly complex problem into a sequence of small easily solved problems. In addition, the amount of steps which must be manipulated at one time is kept to a minimum. Finally, it should be noted that the outline of the step-wise refinement is but one way of representing the solution. A stepwise refinement chart is shown on the next two pages.

LEVEL ONE



PROBLEM: TAKING A BATH

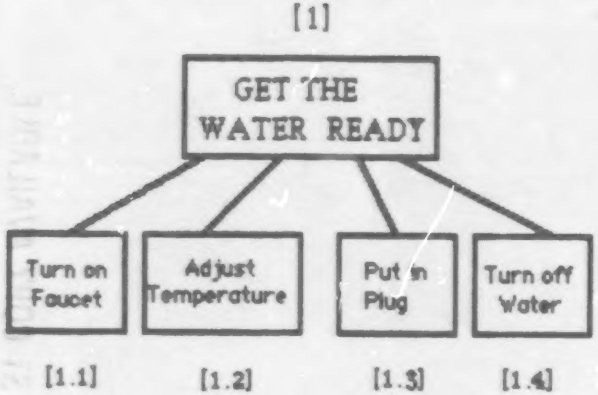
Get the Water Ready

Get Supplies Ready

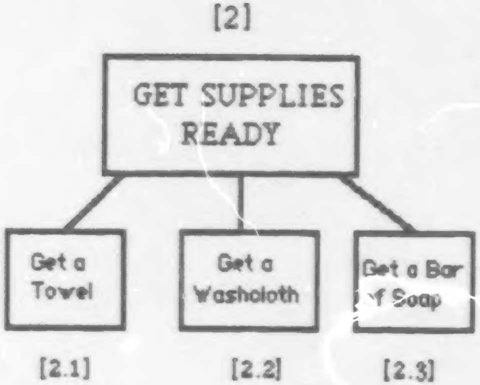
Take a Bath

Finish Up

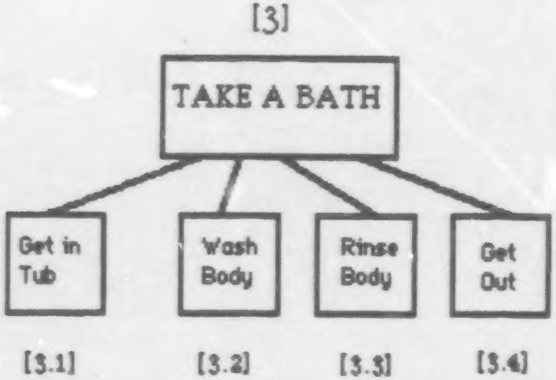
LEVEL TWO



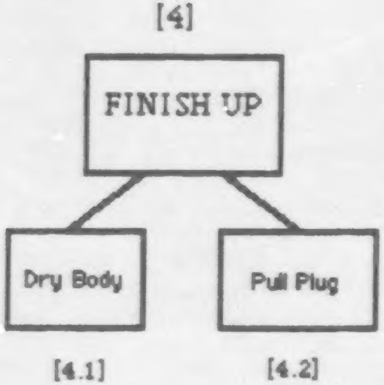
[1]
GET THE WATER READY
- Turn on Faucet [1.1]
- Adjust Temperature [1.2]
- Put in Plug [1.3]
- Turn off Water [1.4]



[2]
GET SUPPLIES READY
- Get a Towel [2.1]
- Get a Washcloth [2.2]
- Get a Bar of Soap [2.3]



[3]
TAKE A BATH
- Get in Tub [3.1]
- Wash Body [3.2]
- Rinse Body [3.3]
- Get Out [3.4]



[4]
FINISH UP
- Dry Body [4.1]
- Pull Plug [4.2]

Teaching Example: Design With Coded Solution

Problem - Write a program which will allow you to input three temperatures, and then print out the maximum, minimum, and average temperature for the day. If the average temperature is below 60, have the program remind you to wear a jacket. If the average temperature is above 90, have the program remind you to wear shorts, or else specify slacks and a shirt.

Design Process - To design a solution to this programming problem by top-down design or stepwise refinement, first split the problem into several, more or less independent, sub-problems. If we can assume that these sub-problems are solvable we have an outline solution to the original problem. In this case the problem can be broken down into 6 sub-problems:

1. Input 3 tempertures T1,T2,T3
2. Determine MAX
3. Determine MIN
4. Determine AVG
5. Determine what to wear, W$
6. Print output - MIN, MAX, AVG, W$

This is called the level 1 outline of the solution. Now each of these sub-problems which are not trivial in nature would again be "refined" into a level 2 outline. However, since each of these sub-problems is trivial, no further refinement is required and they can now each be coded as a subroutine. The coding which follows is only one way the problem could be solved:

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```
10   REM  The following program will input 3 temperatures,
20   REM  determine the MAX, MIN, AVG and suggest
30   REM  what clothes to wear
40   REM  ---------------------MAIN LEVEL----------------------------
50   GOSUB 500:      REM Get Input T1,T2, T3
60   GOSUB 600:      REM Determine MIN
70   GOSUB 700:      REM Determine MAX
80   GOSUB 800:      REM Determine AVG
90   GOSUB 900:      REM Determine Clothes, W$
100  GOSUB  1000:    REM Print Output, MAX, MIN, AVG, W$
110  STOP:           REM End of program
120  REM  -----------------------------------------------------------


500  REM  Subroutine to get input T1,T2,T3
510  REM ==========================================================
520  INPUT  "Enter 3 Temperatures separated by commas";T1,T2,T3
530  RETURN:  REM Return to line 60
540  REM ==========================================================



600  REM  Subroutine to determine MIN
610  REM ==========================================================
620  IF  T1<=T2  AND  T1<=T3  THEN  MIN = T1 : GOTO 650
630  IF  T2<=T1  AND  T2<=T3  THEN  MIN  = T2: GOTO 650
640  MIN = T3
650  RETURN : REM Return to line 70
660  REM ==========================================================


700  REM Subroutine to determine MAX
710  REM ==========================================================
720  IF  T1>=T2  AND  T1>=T3  THEN  MAX = T1 : GOTO 750
730  IF  T2>=T1  AND  T2>=T3  THEN  MAX  = T2: GOTO 750
740  MAX = T3
750  RETURN : REM Return to line 80
760  REM ==========================================================
```

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```
800  REM Subroutine to find AVG of temperatures
810  REM ===================================================
820  AVG = (T1+T2+T3)/3
830  RETURN : REM Return to line 90
840  REM ===================================================


900  REM Subroutine to  determine clothes, W$
910  REM ===================================================
920  IF AVG <= 65 THEN W$ = "Please wear your coat": GOTO 950
930  IF AVG >= 90 THEN W$ = "Please wear your shorts": GOTO 950
940  W$ = "Slacks and a shirt will be fine"
950  RETURN : REM Return to line 100
960  REM ===================================================


1000    REM Subroutine to print output, MAX, MIN, AVG, W$
1010    REM ===================================================
1020    PRINT  "The maximum temperature is "; MAX
1030    PRINT
1040    PRINT  "The minimum temperature is ";  MIN
1050    PRINT
1060    PRINT  "The average temperature is ";  AVG
1070    PRINT
1080    PRINT  W$
1090    RETURN : REM Return to line 110
1100    REM ===================================================
```

DIFFERENTIATED

INSTRUCTION

COMPUTER LITERACY FOR EXPERIENCED STUDENTS

As with any curriculum, teachers of Computer Literacy must decide how best to teach those students who "already know it all." As computers in the home become more prevalent, increasing numbers of students will come to class having previously mastered many of the essential elements for Computer Literacy. In addition, many school districts are offering comprehensive computer literacy programs in their elementary schools. It is important that we do not penalize Computer Literacy students who enter the course having obtained varied degrees of computer competence, regardless of how they acquired the knowledge. Students who are ready for advanced computing concepts should not be required to relearn the fundamentals.

The State Board of Education has provided districts with the flexibility to offer an advanced placement test for students who have mastered the essential elements specified for the Computer Literacy course. While this alternative may be appropriate for some individuals, it should not be a default process for all students who have had previous learning experiences. Most students with computing experience want and can profit from more hands-on time in a Computer Literacy course. Their special instructional needs can be met either in a separate advanced computer literacy course, or through differentiated instruction within the existing course.

Computer Literacy is intended to be a hands-on, activity-based course. This type of course lends itself easily to differentiated instruction. Students may work in groups, on individual programming projects, or solve problems with applications software. By carefully selecting the difficulty and skill level of such assignments, an instructor can keep all students gainfully involved in new learning experiences. Students with previous experience will be able to work independently, leaving the instructor to help beginners.

Assignment of special activities to these experienced students will not only better meet their needs, but will also expose the remainder of the class to a greater range of computer applications. Computer Literacy teachers should identify for each of the five essential elements special assignments which will make differentiated instruction possible.

A variety of activities are listed in this document, many of which will be appropriate for this enrichment. The following are examples which could be used for each element.

ELEMENT I: Terminology and Use

When covering essential elements on terminology and use, students with previous experience might be given an assessment test to determine computing terms with which they still need work. If these same students are experienced at word processing, ask them to produce a glossary of computer terms important in a specific arena of computing, such as data transmission or programming languages. Specific reading assignments in computer publications, followed by oral or written reports for the class, could also be made.

Keep in mind that terminology is best taught when integrated with the content in which it is used. When investigating word processing, those students who already know the basic terminology related to simple word processors could be asked to read the manual for an advanced system. This student or group of students could then make an oral comparison for the class.

When studying the basics of computer use, knowledgeable students could investigate intriguing applications of the computer, such as the role of the computer in the space shuttle or in special effects for movie production. In sharing this information with the class, each student's understanding of the potential impact of computing will be enhanced.

ELEMENT II: History and Development of Computers

Students should be involved in the identification of concepts, such as cause and effect, progress relative to a time, and dependence of each innovation upon prior achievements. Names and dates should not be the emphasis. Provide students who already have a good background in computer history and development opportunities to investigate and share information which might make the study more interesting for the entire class. For example, the pupils might be assigned to study the current status and future projections for fifth generation computer applications. In addition, studies about the personal lives of the innovators of computing such as Ada Lovelace can enhance understanding of the evolution of technology.

ELEMENT THREE: Use of the Computer as a Tool

While beginning students are learning basic operational procedures for the microcomputer, the more experienced can be learning advanced operational skills, such as using utilities for disk backup, saving and deleting files, or the use of program-editing software.

When the class is studying applications software (word processing, data-filing, and spreadsheets systems), give students who already can use a package an opportunity to complete advanced problem-solving with the application or allow them to learn new and more challenging software of the same type. The documentation which comes with applications software is often tutorial in nature and ideally suited for independent learning. These students can also be given the opportunity to master utility and application programs that other students may not use. Examples include chart software, graphic arts utilities, or home budgeting software. If a modem and terminal software are available, these students can master the software and be the operator for class investigations into on-line searching of bibliographic or full-text data bases or electronic mail. These experiences may be used cooperatively with students on other campuses or in other towns.

ELEMENT FOUR: Communicating Instructions to the Computer

While beginning students are learning the fundamentals of BASIC programming, experienced programmers can work on projects which require more advanced skills, such as graphics, sequential and random access file handling, or even machine language. Obviously, students who already have skill should be assigned more challenging programming problems and be expected to develop the methodology skills described in the Structured Programming section of this document. Such students may also need additional practice in programming modification or de-bugging skills. In the activities section for element four, sample extension problems are listed.

There are self-paced materials available to teach pupils the basics of additional computer languages such as PASCAL, authoring languages, and machine language. These experiences will promote a better understanding of the variety of methods in which programmers communicate instructions to the computer.

ELEMENT FIVE: Societal Impact

Students who exhibit prior knowledge of the impact of computing on society can extend their understanding with studies about the projected impact for the future. Small groups may be assigned to investigate and report on the impact of computer-aided design and computer-aided manufacturing on the job market. These students could also form a simulated job placement bureau through which others might survey the required educational background for various computer-related careers.

In summary, it should not be a default decision to "place out" students who are involved actively in the Information Age. These students will bring the enthusiasm and diversity which will make the course rewarding for both the Computer Literacy teacher and their classmates.

As with any curriculum, instruction must be planned to meet the diverse skill and knowledge levels at which students enter. The laboratory nature of the course will make differentiated instruction quite feasible. To meet the instructional needs of our "computer whiz kids" it will be important that Computer Literacy teachers be provided with appropriate hardware, software, and other enrichment resources necessary to help young people further develop their interest in the field of computing.

COMPUTER LITERACY FOR SPECIAL EDUCATION STUDENTS

Teachers of Computer Literacy, like teachers of other content areas, must develop classroom activities which are appropriate to the individual needs of students. Care must be taken that handicapping conditions do not prove to be barriers for students in this course. Modification might include providing access to various kinds of instructional media, limiting the number of reading assignments, or acquiring special adaptive hardware devices for physically handicapped students.

The kind of curricular modification required will necessarily vary, based on the particular handicap of the student, but these ideas may prove helpful to teachers dealing with special students in the mainstreamed classroom.

ELEMENT I: Computer-related terminology and use

-Present information using a variety of media. For example, lengthy reading assignments may prove impractical for some students. Success may be more readily achieved by using films or videotapes to present information or ideas.

-Focus on meanings of words, rather than accurate spelling. Avoid having youngsters memorize long lists of words and their meanings. Instead, introduce vocabulary in a context, introducing only a few new terms at a time.

-Modify vocabulary practice games so they can be played in levels of difficulty. For example, words associated with hardware could be grouped in levels, so that students can work on mastering one set before proceeding to the next.

-Have students participate in the development of vocabulary practice games as well as in the use of these games. In this way, meanings of words will be reinforced by virtue of students' having written them and used them in practice. Most students can develop a computer literacy bingo game or make up questions for a simple board game. (See the Teacher Made Materials section of this document.)

ELEMENT II: History and Development of Computers

-Avoid lengthy reading assignments for students whose reading levels may be below grade level. Use various media to present important ideas as an option to reading assignments. (See the resources section for a list of suggestions.)

-Do NOT require students to memorize facts, dates, places, and unrelated information associated with the history of computing. Concepts such as the relative importance of developments, the inter-relations of events, and an understanding that developments in technology occur in a context are the important features of this element.

-Though it may be appropriate to have students write reports on the history of computing, some may experience more success by presenting information in other formats. For example, some students may not be particularly skillful in writing prose, but may be adept at photography. Such students may want to do a photo essay on computing history and display that essay in a prominent place in the school.

-Have students display information regarding the history of computing in various formats. For example, some students could create bulletin board displays, and others could create a butcher paper timeline. The important factor for special youngsters is that they may need options to lengthy reading and writing assignments as they work on activities related to this element.

ELEMENT III: Using the Computer as a Tool

-In teaching applications software, use prepared data disks, rather than having students develop original data sets. This will allow them to manipulate data using a particular program and alleviate potential frustration associated with input of lengthy text.

-In lessons which involve the use of spreadsheets or data-filing systems, provide students with prepared templates or prepared screens, so they can experience using such software, even if they lack the necessary skills to develop formats or original templates.

-When teaching word processing, give students prepared text with a few mistakes. Have them practice cursor movement and simple editing with this prepared document, rather than keying in original text.

-Use a word processing program and a prepared form letter to give students practice in using the "search" and "replace" functions. Have each one send the letter to several friends or businesses. Examples include promotional sales letters, Christmas family news letters, and Valentine's love letters.

-When possible, involve students in concrete manipulation as a way to introduce complex ideas. For example, before having students perform a search using a data-filing system, try activities such as the "punched card survey" found in the Teacher Made Materials section of this document.

-Discuss the use of applications software by describing a manual process which has been automated. For example, word processing is automated typing; use of a data-filing system is like automating an address book or filing cabinet; and use of electronic spreadsheet is the automation of a pencil, calculator, and paper accounting sheet.

-Have students work in pairs or small groups when completing projects which require the use of applications software. Designate individual tasks to reflect various levels of student skill.

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ELEMENT IV: Communicating Instructions to the Computer

-Some students may have difficulty with programming problems which require sophisticated logic or lengthy code. Rather than having these students develop complex original programs, simply give them sample short programs, and have them modify these samples to produce slightly different output. ("BASIC for Kids" from TEA provides such samples.)

-Encourage group activities and make group project assignments. Students can be paired to reflect different ability levels. Programming projects are particularly appropriate for group work; students can assist one another on specified tasks.

-Be careful to avoid programming problems which require complex math skills. When making a programming assignment, identify which (if any) math skills the solution assumes. For example, in writing a program which will compute the amount of carpet needed to cover a given size floor, the teacher may want to give some students a formula for computing the area of a rectangle.

-Give students some choice in programming assignments, so that if they become frustrated with one problem, they can try another that is less difficult. Some teachers have had good success in grouping problems by levels of difficulty and allowing students to choose particular levels they want to try. One idea is to make a bulletin board display of student-produced solutions with paper sacks stapled to the bottom of the display. In each sack, working from left to right, the problems become increasingly difficult, and students choose particular problems from any sack. As solutions are developed, the hardcopy of the solution is displayed.

-If some students are having difficulty in developing original programs, try giving them simple examples and asking for modifications. These samples can be stored on disk, so that students do not become frustrated with input of lengthy programs. Also, this technique has the additional advantage of teaching students how to load programs from disk to RAM, how to do simple editing, and how to save program changes onto disk.

ELEMENT V: Societal Impacts of Computer Use

-As with other elements which are informational rather than skill oriented, there is a tendency to give students lengthy reading or writing assignments to teach course content. Some students will experience difficulty with these tasks and should, therefore, be given the opportunity to use several media to gain needed information.

-Have frequent group discussions regarding the impact of computers on the society. Often, students who lack written communications skills perform quite well in group discussions.

-If possible, take students on field trips to see various computer applications. This approach is often preferable to other methods of instruction for many students.

COMPUTER LITERACY FOR PHYSICALLY HANDICAPPED STUDENTS

Some districts may find it necessary to acquire special adaptive devices for use with physically impaired students. Luckily, such input/output peripherals are becoming increasingly available and many districts report great success with their use. Some students are currently using computers with these special adaptive devices, not only in Computer Literacy class, but also in the basic skills curriculum. Braille interfaces, speech recognition devices, speech synthesis peripherals, and adapted large keyboards are only a few of the examples of hardware modifications which may be needed by some students. A list of resources which might be useful for those districts seeking to make effective use of microcomputers with handicapped youngsters follows.

SPECIAL EDUCATION SOFTWARE CENTER
SRI International
333 Ravenswood Avenue
Menlo Park, CA 94025

NATIONAL ASSOCIATION OF STATE DIRECTORS OF SPECIAL EDUCATION (NASDSE)
1201 Sixteenth Street NW
Suite 404E
Washington, DC 20036

NATIONAL EASTER SEAL SOCIETY
2023 West Ogden Avenue
Chicago, Illinois 60612

SECTOR PROJECT
Development Center for the Handicapped
UMC - 68
Utah State University
Logan, Utah 84322

WESTERN CENTER FOR MICROCOMPUTERS IN SPECIAL EDUCATION
1259 El Camino Real
Suite 275
Menlo Park, CA 94025

INTERNATIONAL COUNCIL FOR COMPUTERS IN EDUCATION
University of Oregon
1787 Agate Road
Eugene, OR 97403-1923

COMPUTER
CLUBS

COMPUTER CLUBS

Computer clubs meeting at regularly scheduled intervals provide teachers with stimulating ways to interact with students on an informal, non-evaluative basis. The amount of time needed to engage in many valuable computer-related experiences often makes them unsuitable for inclusion during regular computer literacy classes. Such restraints, however, do not hamper after-school computing clubs. As a result, they offer many opportunities for students to explore a wide range of computer applications, to develop programming proficiency, and to simply have fun with the computer. Moreover, by making such participation available to students, whether or not they are enrolled in computer classes, computer clubs make the school's computing facilities available to all students who are especially interested in this field. Many activities appropriate for inclusion in club agendas have been identified. Some of these are:

1. FIELD TRIPS. Students might visit local businesses, a hospital, newspaper office, or bank to observe computer utilization. A research center at a nearby university or a place conducting simulation training, such as a space center, would also be good places to visit. In addition, a visit to a local computer store investigate the different types of software available, could also be worthwhile.

2. SOFTWARE DEMONSTRATIONS. The teacher or a local representative from a computer store might expose students to a new game, a new word processing package, or other types of software by demonstrating different types of software. Time might also be provided for students to interact with the software.

3. PROGRAMMING ACTIVITIES. Extra time in the computer lab with teacher assistance enables students to refine their skills as well as to acquire more advanced programming prowess.

4. GUEST SPEAKERS. Guest speakers, such as hardware manufacturers and developers, software programmers, repair persons, data processors, university professors, adult hobbyists, and computer-using professionals in fields such as health care, insurance, real estate, banking, education, law, and publishing provide students with a much broader perspective on the impact of computers on society and in the job market.

5. THEME PROGRAMS. Special programs can be presented to expand students' knowledge of computer capabilities. Possible programs might relate to new developments in personal computing software, artificial intelligence, modems and electronic bulletin boards, on-line data bases, music synthesizers, educational games and software, programming tips, and home and business applications for the personal computer. In addition to these activities, a computer club might also undertake various projects that would not only be beneficial to the club itself, but also to the school and the community at large.

6. SCHOOL COMPUTER SERVICES. Students might contact personnel in the school, such as teachers, administration, or cafeteria staff, to identify tasks they could facilitate for them through the use of a computer. As a result they might develop a data base of school menus or recipes for the cafeteria staff, a data base to keep track of student absences for the attendance office, or a data base of games played, scores and vital statistics from each game for the athletic department.

7. SOFTWARE LIBRARY. Club members could utilize a variety of techniques to acquire software for a school software library. They might solicit software contributions from individuals and businesses, or engage in fundraising activities to acquire funds for purchasing additional software.

8. FUNDRAISING PROJECTS. The club can sponsor various fundraising projects to acquire funds needed for club operations, activities, and travel.

9. COMPUTER FAIR OR OPEN HOUSE. These activities provide a forum for showcasing student work, skills, and products before the public. They afford an excellent opportunity to disseminate information about computers and computer applications.

10. TUTORING PROGRAM. Students can utilize educational software to help other students having difficulty mastering the content in specific subject areas.

11. CONTEST. Competitive activities can be arranged in which prizes are awarded to students judged to have written the best programs submitted. Organized computer contest are also available on a state and national basis. For example, the Texas Computer Education Association sponsors a state computer literacy contest exam for junior high students and programming contests for high school students.

Participation in a computer club and its activities provides students with valuable experiences which would otherwise be unavailable to them. Through these experiences they develop a deeper appreciation of the computer and its capabilities and become more confident of their ability to control it. As a result, they will be better prepared to function in the information society of the future.

KEYBOARDING

KEYBOARDING

The effective teaching of Computer Literacy will depend, to a very large extent, on the degree of proficiency students have with the device itself. This implies that keyboarding skills may be an important prerequisite skill to the use of the computer.

The term "keyboarding", as it is used here, implies such skills as:

1. proper finger placement and technique to access each character;
2. familiarity with the function of nonstandard keys such as esc, control, delete, return or enter, reset, cursor control, and others;
3. the ability to use the backspace key to delete and replace characters mistyped;
4. sufficient typing speed to make programming or the use of applications programs feasible.

It is recommended that each district plan to incorporate keyboarding into the instructional program, either prior to the junior high course, or as a part of the course itself.

Many schools are successfully incorporating the teaching of keyboarding into the early grades, as a part of the students letter recognition and early reading experience. In some cases, computer systems are used, and in others standard or electric typewriters are used. Certainly, the earlier children can be exposed to keyboarding skills, the sooner they will be prepared to use modern tools.

In districts where early instruction in keyboarding is not possible, it is strongly recommended that keyboarding instruction and practice be included as a part of the laboratory, hands-on component of the course. Though Computer Literacy should not become a typing course, it must include some keyboarding instruction if students are to be productive in using the computer as a tool. It should be noted that keyboarding experience does not reduce the need for students to take formal courses in typing since additional skills and knowledge are covered in those classes.

Whether keyboarding is taught prior to the Computer Literacy course, or as an integral part of it, it should be noted that the computer itself can be used as an effective teaching tool to deliver this important skill. Several automated systems, both for instructing keyboarding technique and for practicing keyboarding, are available for most standard microcomputers.

Additionally, traditional keyboarding lessons may be used. Many typing tutorials are intended solely for building speed and accuracy. Others actually teach finger placement and proper technique. A sample of such software follows:

Typewrite
Barron Enterprises
714 Will Glen Road
Santa Barbara, California 93105
ph: 805-687-5873

Typing Strategy
Behavioral Engineering
230 Mt. Herron Rd.
Suite 207
Scotts Valley, California 95066
ph: 408-438-5649

Alphabetic Keyboarding
South-Western Publishing
5101 Madison Rd.
Cincinnati, Oh 45227
Attn: Benjamin H. Willard

SAMPLE RESOURCES

RESOURCES

The resources listed in this section are meant to assist schools as they begin to review and evaluate commercial materials or resources for local use. Inclusion on this list does not imply endorsement, nor should it be assumed that the list is an exhaustive one. New products appropriate as resources in the Computer Literacy curriculum are becoming available rapidly, and school personnel are encouraged to investigate other sample resourse lists in order to have access to new products.

BOOKS

The Analytical Engine - Computers: Past, Present, and Future.
Bernstein, Jerry.
Morrow

Are You Computer Literate?
Billings, Karen and Moursund, David
Dilithium Press, 1979

Basic With Style: Programming Proverbs
Nagin, P. and Ledgard, H.F.
Hayden Book Co., Inc.

Basic Workbook For Microcomputers
Spencer, D.
Camelot Publishing Co.

The Beginner's Guide to Computers
Bradbeer, R., De Bono, P. and Laurie, P.
Addison-Wesley, 1982

Bits'n Bytes About Computing: A Computer Literacy Primer
Herller, R.S. and Martin, C.D.
Computer Science Press,1982

The Complete Computer
Van Tassel, D.L.
SRA, 1976

Computer Literacy: Issues and Directions for 1985
Seidel, R.J., Anderson, R.D., and Hunter, B.
Academic Press, 1982

Computeronics: Problem Solving With Computers
Leon County Public Schools,
Tallahasse, Florida

Computers & Man
Dorf, R.D.,
Boyd Fra,1982

Computers and Privacy
Biological Sciences Curriculum Study, 1980

Computers and Social Controversy
Logsdon, T.
Computer Science Press, 1980

Computers in Society
Sanders, D.
McGraw-Hill, 1981

Computers in Today's World
Bitter, G.G.
John Wiley & Sons, Inc.

Goodbye Gutenberg: The Newspaper Revolution of the 1980's
Smith, A.
Oxford University Press, 1980

ICCE Publication:
  An introduction to Computers and Computing
  Precollege Computer Literacy: A Personal Computing Approach.
International Council for Computers in Education
The University of Oregon

The Micro Millennium
Evans, C.,
Viking Press, 1979

My Students Use Computers: Computer Literacy in the K-8 Curriculum
Hunter, B.
Reston Publishing Co.

Running Wild, The Next Industrial Revolution
Osborne, A.
Osborne-McGraw Hill, 1982

Spotlight on Computer Literacy
Richman, E.
Random House, School Division, 1982

The Third Wave
Toffler, A.
Bantam Books, 1980

Using a Microcomputer in the Classroom.
Bitter, G. G. and Camuse, R. A.
John Wiley & Sons

The Wired Society: A Challenge for Tomorrow
Martin, J.
Prentice-Hall, 1978

Writing in the Computer Age - Word Processing Skills & Style for Every Writer
Fluegelman, A. and Hewes, J.J.
Doubleday, 1983

The Word Processing Book - A Short Course in Computer Literacy
McWilliams, P.,A.
Prelude, 1982

Computer Literacy: A Hands-on Approach
Luehrmann, A. and Peckham, H.
McGraw-Hill, 1982

Computer Literacy: Problem-Solving with Computers
Horn, C. and Poirot
Sterling Swift Publishing Co.

Computer Power: A First Course in Using the Computer
Moshell, M. et.al.
McGraw-Hill, Gregg Division

Exploring the World of Computers
Spencer, Donald
Camelot Publishing Co.

Karel the Robot: A Gentle Introduction to the Art of Programming
Pattis, R.E. 1981
Wiley & Sons

New Tech Workbooks
  Computer Thinking
  Computer Dictionary
  New Jobs
  New Technology
  Word Processing
  Understanding Computers
Scholastic Press

Scholastic Computing
Roberts, J.L. ed.
Scholastic Inc., 1984

Tales of the Marvelous Machine
Taylor, R. and Green, B. eds.
Creative Computing Press, 1980

Understanding Computers
Spencer, D.
Camelot

An Introduction to Computers
Spencer, D.
Merrill Publishing Company, 1983

The Mind Tool Computers and Their Impact on Society
Graham, Neill
West Publishing, 1983

Understanding Computers
Hopper, Grace Murray and Mandell, Steven L.
West Publishing, 1984

Using BASIC
Didday, Rich and Page, Rexl
West Publishing, 1984

Computer Literacy Through Applications
Kurshan, Barbara Dr. and November, Alan and Stone, Jane
Houghton Mifflin, 1985

JOURNALS

ACM Sigcue Bulletin - Contains interviews with leading authorities in the field. (Published quarterly)

ADDRESS: Association for Computing Machinery
Computer Uses in Education Group
P.O. Box 12015
Church Street Station
New York, NY. 10249

AEDS Journal - Designed for a research-oriented audience; contains reports of original research. (Published quarterly)

ADDRESS: Association for Educational Data Systems
1201 Sixteenth Street, NW
Washington, DC 20036

Classroom Computer Learning - This publication links computer-based learning with traditional classroom instruction. Published nine times during the school year, the magazine includes: teacher-developed classroom ideas, articles with original programs, software reviews, and a pullout poster for classroom use. Manufacturers' information on new products and a calendar of events in the educational computing world also appear in each issue. Two of the issues are directories; one lists educational computer resources and the other covers educational software.

ADDRESS: Pitman Learning, Inc.
19 Davis Drive
Belmont, Ca 94002

Classroom Computer News - Designed for those more inexperienced users; uses nontechnical terms, often contains articles with program listings. (Published bimonthly)

ADDRESS: Intentional Educations
51 Spring Street
Watertown, MA 02712

Computing Teacher - Designed for an audience of elementary and secondary school teachers; includes both general educational and technical articles. (Published nine times a year)

ADDRESS: The Computing Teacher
Department of Computer and Information Science
University of Oregon
Eugene, Oregon 97403

Educational Computer - A magazine intended for educators from preschool through college level. Features a regular column on preschool computer activities for young children. (Published bimonthly)

ADDRESS: Edcomp, Inc.
P.O. Box 535
Cupertino, CA 95015

Educational Technology - A media magazine oriented towards educators; has regular columns on instructional computing. (Published monthly)

ADDRESS: Education News Service
140 Sylvan Ave.
Englewood Cliffs, NJ 07632

Electronic Education - Designed for more inexperienced users; covers all applications of educational technology. (Published monthly)

ADDRESS: Electronic Communications, Inc.
Suite 220
1311 Executive Center Drive
Tallahassee, Fl 32301

Electronic Learning - A magazine which covers aspects of both hardware and software. It is designed for educators. (Published bimonthly)

ADDRESS: Scholastics Inc.,
50 W. 44th Street
New York, NY 10036

Instructional Innovator - Describes applications of educational media; has special issues on microcomputers in education (Published monthly)
ADDRESS: Association for Educational Communications and Tech.
1126 Sixteenth Street NW
Washington, DC 20036

Instructor - This publication is a general interest magazine for preschool through junior high school teachers. Features include articles on ways teachers use computers, interviews with leaders in the field, and product reviews. Instructor publishes a monthly computer column containing news items. It also regularly surveys readers on teacher attitudes about computers and publishes the results.
ADDRESS: Instructor
P.O. Box 6099
Duluth, Mn 55806

Teaching and Computers - Geared to elementary school teachers, this magazine provides information and suggestions for integrating computers into the classroom. It includes nontechnical information about how computers work, teacher-developed lesson ideas, and information about new books and resources.
ADDRESS: Teaching and Computers
Scholastic, Inc.
730 Broadway
New york, NY 10003

T.H.E. Journal - Acronym for Technological Horizons in Education; contains both theoretical and practical articles. (Published six times a year)
ADDRESS: T.H.E. Journal
P.O. Box 17239
Irivine, CA 92713

STUDENT JOURNALS

Digit - This publication is a magazine designed for teenage computer users.
ADDRESS: Digit Magazine
Customer Service Department
P.O. Box 27958
San Diego, CA 92128

K-Power - This publication is a magazine designed for teenage computer users.
ADDRESS: K-Power
P.O. Box 2725
Boulder, Co 80321

Microzene - school edition Grades 4-8. An interactive magazine on a computer disk. Each bimonthly disk contains four interactive programs that give students opportunities to use their critical reasoning, problem-solving, and programming skills. Documentation includes a step-by-step student handbook with each issue, and a 16 page Teaching Guide, with lessons plans. (Apple version only.)
ADDRESS: Scholastic, Inc.
2931 East McCarty St.
P.O. Box 7502
Jefferson City, MO 65102

Scholastic News - Grades 1-6 Scholastic's weekly magazines for classrooms now include pencil-and-paper computer literacy and awareness activities and articles in each issue.
ADDRESS: Scholastic, Inc.
2931 East McCarty St.
P.O. Box 7502
Jefferson City, MO. 65102

SOFTWARE

Story Tree - An interactive story writing program for grades 4-12. Helps students generate ideas, write a first draft, revise and edit, and share their writing with others. Students can write mystery and adventure stories, interactive news articles, structured book reports, data bases, etc.

ADDRESS: Scholastic, Inc.
2931 East McCarty Street, PO Box 7502
Jefferson City, MO 65102

Mastertype Keyboarding - Keyboarding practice presented sequentially.

ADDRESS: Lightning Software
P.O. Box 5223
Stanford, CA 94305

Typing Tutor - Interactive keyboarding practice. This program is available for several microcomputer types.

ADDRESS: Microsoft Consumer Products
400 108th Ave. North East
Bellevue, WA 98004

Type Attack - Keyboarding practice presented in a game format.

ADDRESS: Sirius Software
10364 Rockingham Drive
Sacramento, CA 95827

Basic Keyboarding & Typewriting Applications - A combination of computer disks, textbook, and audio tapes are available for typing and keyboarding instruction.

ADDRESS: Southwestern Publishing Co.
11310 Gemini Lane
Dallas, TX 75229

Appleworks - An integrated software package that combines word processing, spreadsheet, and data-base applications. An interactive tutorial is available.

ADDRESS: Apple Computer
20525 Mariani Avenue
Cupertino, California 95014

PFS Write - a word processor
PFS Proof - companion speller for PFS Write
PFS File - A form based data filing system
PFS Report - A companion to PFS File which allows tabular output of data
ADDRESS: Software Publishing Corporation
1901 Landings Drive
Mountain View, CA 94043

Bank Street Writer - Simplified word processing system includes a Teacher's Manual that both explains how to use the program and develops extension writing activities. An interactive tutorial is included.

ADDRESS: Scholastic
2931 East McCarty Street, PO Box 7502
Jefferson City, MO 65102

Bank Street Speller - This speller proofreads your students' text and highlights errors. Then, it displays the correct spelling.

ADDRESS: Scholastic
2931 East McCarty Street, PO Box 7502
Jefferson City, MO 65102

Activity Book for Bank Street Writer - includes both practice activities using the Writer and composing activities.

ADDRESS: Scholastic
2931 East McCarty Street, PO Box 7502
Jefferson City, MO 65102

The School Tool - Includes software and documentation for: word processing, data base manager, data analysis, math checker, quiz master, calculator, message scroller, time minder, and data maps.

ADDRESS: Encyclopedia Britannica
425 North Michigan Ave.
Chicago, IL 60611

Practicalc - Electronic spreadsheet
Practifile - Data filing system
Easyscript - Wordprocessing system
Secret File- Simplified data filing system
Available from Regency Educational Systems
ADDRESS: 7407 Brentfield Drive
Dallas, TX 75248

Data File - a data filing system
ADDRESS: Datafile Corp.
100 W. Hwy. 332
1222 Brazos Mall
Lake Jackson, Texas 77566

DB Master Version 4 Plus - a data-filing system with a report generator
DB Master Business Writer - a word processing system
ADDRESS: Stoneware Incorporated
50 Belvedere Street
San Rafael, Ca 94901-4870

AUDIO VISUALS

Micro Moppets - 5 tapes featuring
History of Computers
The Functions and Use of the Computer
Computer Terminology
How to Give Instructions to the Computer
Computer Careers
Included are pretelecast activities, class discussion questions, follow-up activities, worksheets and transparency masters, chapter tests, designed for 4th-6th grade students.

ADDRESS: Terry Crane
Computer Instruction
1300 Cypress Road
Richardson, Texas 75080

Computer Graphics Calendar - visual display

ADDRESS: Addison-Wesley
General Books Division
Reading, MA 01867

COMPUTER LITERACY SERIES, Filmstrips with Cassettes or Records
No. 1201 Computers: How They Got Here
No. 1202 Computers: How They Are Made and Used
No. 1203 Computers: Operating a Microcomputer
No. 1204 Computers: Today and Tomorrow
(teacher's guide with cassette or record)

ADDRESS: Marshfilm
P.O. Box 8082
Shawnee Mission, Ka 66208

Classroom Applications of Microcomputers - Video
Using a Computer in the Elementary School - Video
Educational Software - Video
Teaching Computer Literacy and Programming - Video
ADDRESS: Alameda County Superintendent of Schools
Learning Resource Services
Public Sales
685 A Street
Hayward, CA 94541

Adventure of the Mind Series: Personal computing is examined in terms of its applicability to individual needs and its present and potential influence on both the individual and society. Produced in 1979 by The International Instructional Television Cooperative, Inc. In addition to the 16mm version cited above, this series may be purchased in 3 video formats: 3/4" U-matic cassette, 1/2" Betamax, and 1/2" VHS.
The Personal Touch
Hardware and Software
Speaking and Language
Data Processing, Control, Design
Programming for Microcomputers
Computer Graphics for Communication
For Better or Worse
Extending Your Reach
ADDRESS: Audio Visual Center
Indiana University
Bloomington, IN 4705

Microworld -- Film
Incredible Machine -- Film
The Thinking ??? Machines -- Film
Communications Milestone: Invention of the Electrical Digital Computer -- Film or Videotape
Digital Computer -- Film or Videotape
The Quiet Revolution -- Videotape
ADDRESS: Bell Laboratories
Film & Tape Library
150 J. F. Kennedy Parkway
Short Hills, NJ 07076

All About Computers -- Filmstrips
Computer Literacy Series -- Filmstrips
Computer Concepts -- Filmstrips
ADDRESS: Charles Clark Co., Inc.
168 Express Drive South
Brentwood, NY 11717

Computers: The Inside Story -- Film
Computers: Tools for People -- Film
ADDRESS: Churchill Films
662 N. Robertson Blvd.
Los Angeles, CA 90069

Advanced BASIC Techniques -- Filmstrip
BASIC for Elementary Grades -- Filmstrips
BASIC for Microcomputers -- Filmstrips
Careers in Computers -- Filmstrips
Computer Literacy and Understanding -- Filmstrips
Discover LOGO -- Filmstrip
Know Your Computer -- Cassette/worksheet
Operating The Microcomputer -- Video
ADDRESS: Educational Activities
P.O. Box 392
Freeport, NY 11520

Computers in Our Society -- Filmstrips
Understanding Computers -- Filmstrips
ADDRESS: Encyclopdia Britannica Educational Corporation
425 N. Michigan Ave.
Chicago, IL 60611

The Computer Programme -- Video
ADDRESS: Films Incorporate
733 Green Bay Road
Wilmette, IL 60091

Computer Basics -- Filmstrips
Computers: From Pebble to Programs -- Filmstrips
Computer Hardware: What it is and How it Works -- Filmstrips
At Home with Computers: What it can do for you -- Filmstrips
The Computer -- Filmstrip
Understanding Computers -- Filmstrip
Microcomputers -- Filmstrip
ADDRESS: Follett Library Book Comnpany
4506 Northwest Highway
Crystal Lake, IL 60014

Computers: What They're All About -- Filmstrip
ADDRESS: January Productions
124 Rea Avenue
Hawthorne, NJ 07506

About Computers -- Film
Computers in Your Life -- Film
The Information Machine - Film
ADDRESS: Modern Talking Picture Service
500 Park Street North
St. Petersbug, FL 33709
An Introduction to Computers and Data Processing -- Filmstrip
Apple Computer BASIC -- Filmstrip
TRS-80 BASIC -- Filmstrip
Introduction to Microcomputers -Filmstrip
Getting to Know the Micros -- Filmstrip
Computer Components -- Filmstrip
The Computer Glossary -- Filmstrip
Terminology for Computer Literacy -- Filmstrip
Programming BASIC -- Filmstrip
Robotics -- Filmstrip
Our Computer Society -- Filmstrip
ADDRESS: Prentis Hall Media
150 White Plains Road
Tarrytown, NY 10591

Careers With Computers: Jobs for Today -- Filmstrip
How a Computers Works -- Filmstrip
Understanding the Computer -- Filmstrip
ADDRESS: Sunburst Communications
39 Washington Ave.
Pleasantville, NY 10570

Computers and the Future -- Film
Computers, Spies and Private Lives -- Film
ADDRESS: Time-Life Video
Distribution Center
100 Eisenhower Drive
P.O. Box 644
Paramus, NJ 07652

A Hard Day's Hardware -- Filmstrip
Computers: The Truth of the Matter -- Film
Computers: The Friendly Invasion -- Film
Software to the Rescue -- Filmstrip
The Computer: A Proper Introduction -- Filmstrip
The Computer Kid -- Filmstrip
Tron -- Film
ADDRESS: Walt Disney Educational Media Company
500 South Buena Vista St.
Burbank, CA 91521

The Mind Machines - 16mm, 57 minutes, secondary and up - Applications of Artificial Intelligence.
ADDRESS: Time Life Multimedia
Room 32-48
Time & Life Building
New York, NY 10020

Audio Visual Library on Computer Education - A 15 part series providing an overview of computer education. Instructors guides are available. The following titles prouduced by Prismatron are available separately or as a set:

The BASIC Series
The Computer
Computer Numbers
Computer Terminals
Input and Output Units
Introduction to Programming
The Micro Revolution
Microcomputers
Secondary Storage
The Silicon Chip
Understanding Computers

ADDRESS: Follett Library Book Co.
4506 Northwest Highway
Crystal Lake, IL 60014

Understanding Computers In Our World - Filmstrip
Understanding Microcomputers - Filmstrip
Understanding Computer Graphics - Filmstrip
Understnding BASIC Programming Concepts- Filmstrip
Understanding BASIC Programming Skills - Filmstrip

ADDRESS: Learning Tree Micromedia
Post Office Box 4116
Englewood, Colorado 80155

Mr. Microchip - Video 13 part series dealing with computers and their uses.

ADDRESS: Journal Films, Inc.
930 Pitner
Evanston, Illinois 60202

PROFESSIONAL ORGANIZATIONS AND OTHER SOURCES OF ASSISTANCE

Association for Educational Communications and Technology (AECT) promotes the effective use of media and technology in education. It supports a special task force on microcomputers and is currently working on Project BEST which will include a microcomputer program database and computer networking. AECT's purpose is to increase understanding and information sharing of educational computing and its use in basic skills education. Publications: Educational Communication and Technology Journal, Journal of Instructional Development, Instructional Innovator.

ADDRESS: AECT
1126 Sixteenth Street, NW
Washington, DC 20036

Association for Educational Data Systems (AEDS) is a professional organization for those interested in the use of computers in education. AEDS produces three quarterly publications: The AEDS Bulletin, which focuses on inter-chapter communications, and meeting announcements, the AEDS Monitor, which contains short, timely articles on current directions in educational data systems, and the AEDS Journal, which features articles illustrating the latest developments in the application of computer technology to all areas of education. Additional activities include an annual international convention, special seminars and workshops, and a computer programming contest for students in grades 7 through 12.

ADDRESS: AEDS
1201 16th St. NW
Washington, DC 20036

International Council for Computers in Education (ICCE) is a non-profit professional organization dedicated to improving the instructional use of computers. Its journal, The Computing Teacher, is a journal for people interested in the instructional use of computers at the precollege level. It focuses on with the use of computers and their impact on the general curriculum.

ADDRESS: Department of Computer and Information Science
University of Oregon
Eugene, OR 97403

Northwest Regional Educational Laboratory Microcomputer Software and Information for Teachers (MicroSIFT) is a project of Northwest Regional Educational Laboratory, and serves as a clearinghouse for microcomputer K-12 instructional software information. The clearinghouse focuses both on establishing effective procedures for the collection, evaluation, and dissemination of materials and information, and on providing user support and technical assistance. Quarterly newsletter - MicroSIFT News.

ADDRESS: MicroSIFT
300 S.W. Sixth AVE.
Portland, OR 97204

Special Interest Group for Computer Use in Education (SIGCUE) The Association for Computing Machinery(ACM) Quarterly

ADDRESS. SIGCUE
11 West 42nd St.
New York, NY 10036

Texas Computer Education Association - TCEA is the largest professional association in Texas for educators who are using computer technology. The association sponsors a State conference and numerous area conferences each year for educators to share their skills. In addition the association sponsors computer programming contests for students. Numerous computer publications are offered at reduced rates to members as well as an electronic network and bulletin board system. The TCEA News is published Quarterly.

ADDRESS: TCEA
P.O. Box 2573
Austin, TX 78768

Texas Association for Educational Data Systems - This association provides a means for sharing information about educational data processing and the impact of the computer sciences on education.

ADDRESS: P.O. Box 632
Austin, TX 78767

TEACHER - MADE MATERIALS

EGG CARTON COMPUTER

ESSENTIAL ELEMENT ADDRESSED: Communicating instructions to the computer

MATERIALS:
egg carton (one per student)
blank piece of paper, about 4" x 10"
10 - 40 strips of paper, 3/4" x 3"
1 strip of colored paper, 3" long in shape of an arrow
10 1" paper squares
adhesive labels, cut into 1" squares

INSTRUCTIONS FOR MAKING:

(Have students make their own egg carton computers.)

1. Open the egg carton. Write the numbers 1 - 12 consecutively, one number per cell, on the back wall of each cell in the egg carton. (See diagram.) The egg carton will serve as a computer with 12 memory cells.
2. Attach the blank piece of paper to the inside cover of the egg carton. It will serve as the computer output screen.
3. The arrow-shaped piece of paper will serve as a program step indicator.
4. The 1" squares will be used to hold data to be placed in memory cells during execution of a program.
5. The strips of paper will hold program statements that are placed in memory cells.
6. Adhesive labels will be used to indicate variable labels.

INSTRUCTIONS FOR USE:

1. Students write program statements onto the program strips, one statement per strip. The line numbers begin with 1 and are numbered consecutively.
2. Place the program strips into the cell in the egg carton computer that matches the program's line number.

3. Write the variable names used in the program on the adhesive labels (one variable name per label) and stick onto the back wall of the empty cells. These cells are then ready for storing data during program execution.
4. Use the arrow as a program step indicator and move it from cell to cell so that it always points to the memory cell containing the instruction currently being executed.

EXAMPLE:

```
1 PRINT "WHAT IS YOUR FAVORITE NUMBER";
2 INPUT N
3 PRINT N; "CHEERS FOR ME"
4 END
```

Preparation for executing the program:

1. Clear the memory cells of program strips, data squares, and variable labels from previous program.
2. Copy the statements onto four program strips which are placed in the first four memory cells.
3. Write the variable name N on an adhesive label which is stuck onto the back wall of memory cell 5.
4. Place the arrow (program step indicator) so that it points to the first memory cell.

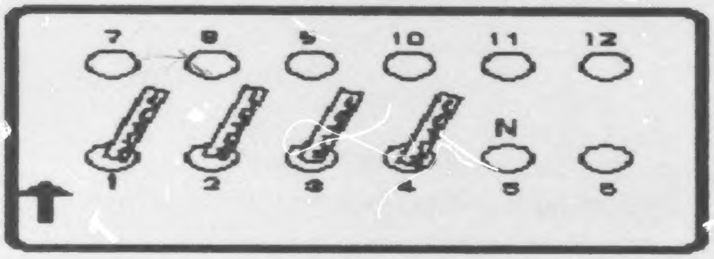
Execution of the program:

1. Locate the memory cell indicated by the program step indicator and read the instruction in the memory cell.
2. Execute the instruction after returning it to the memory cell and "increment the program step indicator" by moving the arrow to the next memory cell. (In the case of the GOTO or IF statement, the arrow may be moved to a different cell.)
3. Repeat this "fetch and execute cycle" over and over again until the END statement is executed.
4. Record any output or echoed input on the piece paper you placed in the inside cover.

SOLUTION OF THE PROGRAM ON THE EGG CARTON COMPUTER:

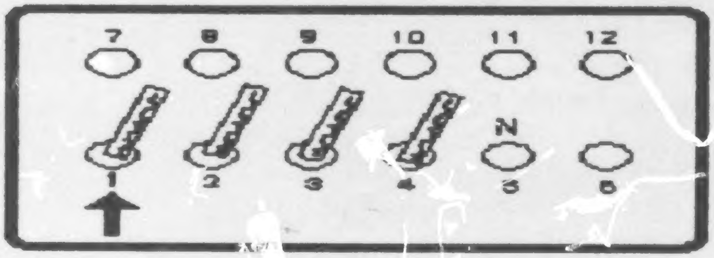
```
1 PRINT "WHAT IS YOUR FAVORITE NUMBER."
2 INPUT N
3 PRINT N; "CHEERS FOR ME"
4 END
```

Output


7
8
9
10
11
12
N
1
2
3
4
5
6

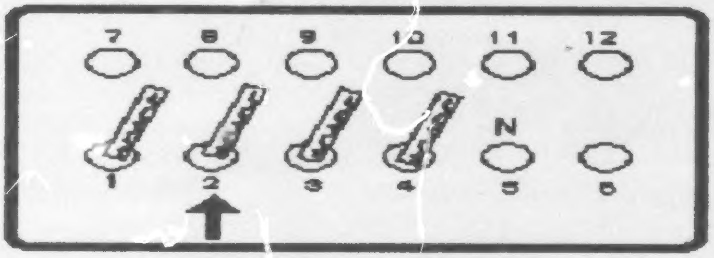
Program ready for execution

```
>
```


7
8
9
10
11
12
N
1
2
3
4
5
6

After step 1

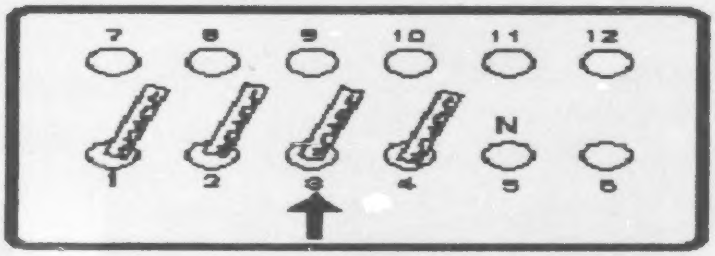
```
What is your
favorite number?
```


7
8
9
10
11
12
N
1
2
3
4
5
6

After step 2

```
What is your
favorite number?

? 5
```


7
8
9
10
11
12
N
1
2
3
4
5
6

After step 3

```
What is your
favorite number?

? 5

5 CHEERS FOR ME
```

BINARY SORT WITH PLAYING CARDS

ESSENTIAL ELEMENT ADDRESSED: Communicating instructions to the computer (extension activity)

MATERIALS:
deck of playing cards
hole punch
paper clip
scissors

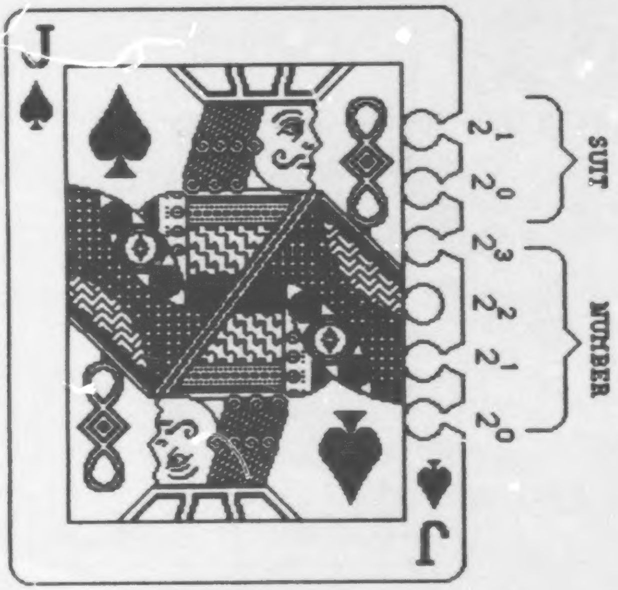
INSTRUCTIONS FOR MAKING:

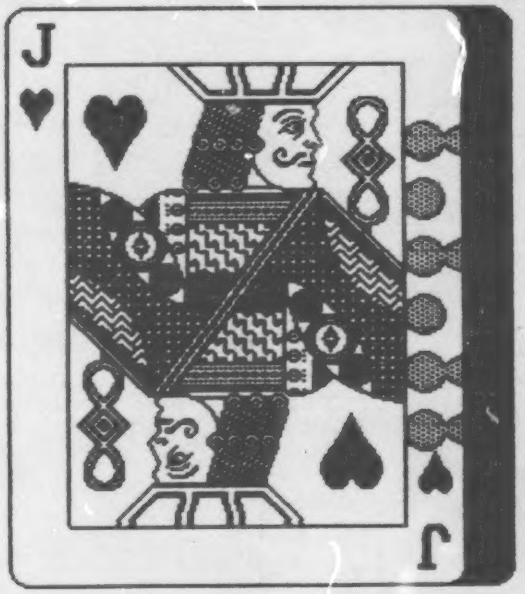
1. Punch six holes, evenly spaced, across the side of each card. (It is best to do this in a print shop, using a drill press machine, so that the holes will be evenly spaced on each card.)
2. The first four holes, beginning with the right-most hole, represent place value in base two. The first hole represents the ones place, the second hole, the twos place, the third hole, the fours place, and the fourth hole, the eights place.
3. Snip off the top of the holes appropriately to represent base two numbers. For example, 7(base ten) = 111 (base two). Therefore, the seven of diamonds, for example, would have all three right-most holes clipped. (See Binary Card Game activity for additional, similar examples.)
4. Face cards are given the following base ten values: Jacks = 11, Queens = 12, and Kings = 13.
5. The two left-most holes are used to code suit. Using the following binary code for suit, clip the holes as needed on each card.
   Clubs: 00
   Diamonds: 01
   Hearts: 10
   Spades: 11

INSTRUCTIONS FOR USE:

To demonstrate sorting and searching processes:

1. Shuffle the deck of cards.
2. Extend a paper clip, insert through the first hole on the right (ones place). Stack so that all cards with the first hole cut will fall off.
3 Put the cards which fall off to the back of the stack and repeat the process for the twos place, the fours place, and the eights place. The resulting set of cards should be in numeric order.
4. In addition to sorting in numeric order, the cards can be sorted by suits using the fifth and sixth holes.
5. Now reshuffle the deck. Use the extended paper clip to search for various cards. Ie., find the 3 of clubs, the 4 of hearts, and the 6 of diamonds.





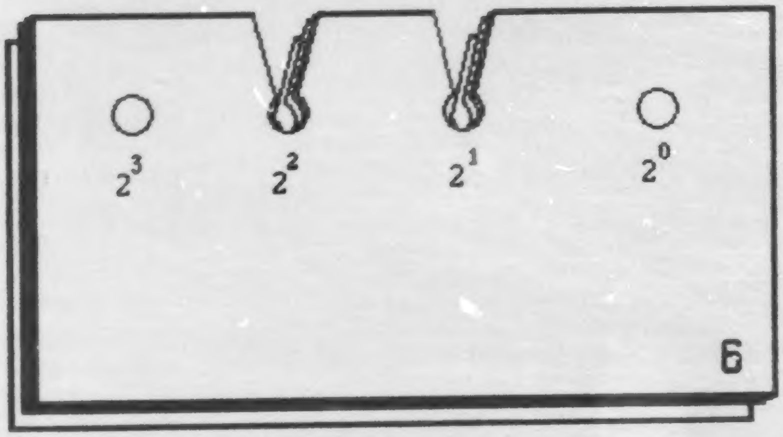
BINARY CARD GAME

ESSENTIAL ELEMENT ADDRESSED: Communicating instructions to the computer
Using the computer as a tool (sorting)

MATERIALS: 15 3" x 5" index cards per student
scissors
hole punch
black marker
extended paper clip

INSTRUCTIONS FOR MAKING:

1. Punch 4 holes 1" apart on the 5" side of the index cards.
2. Each hole will represent place value in base two numeration.
3. Under each hole, write 2 raised to appropriate powers, as well as the value of each place.
4. Number each card (using decimal numeration) 1 - 15 on the lower right corner.
5. Designate the value of the number written on the card by clipping appropriate holes. Clipped holes represent a 1, and closed holes represent a 0. In the example below, the decimal number 6 is shown, since 110(base two) = 6(ten).



Note: Each student should construct his/her own set of 15 cards.

INSTRUCTIONS FOR USE:

1. Shuffle the cards to mix up their order.
2. Stack all 15 cards, punched side up.
3. Extend a paper clip and insert through the first hole on the right hand side. All cards that have a closed hole in the one's place will remain on the paper clip. All others will drop off.
4. Place the cards which drop off at the back of the stack.
5. Now put the paper clip through the twos place and follow the same procedure.
6. Continue this process through and and including the eights place hole. The cards should be in numeric order.

BINARY MIND READING

ESSENTIAL ELEMENT ADDRESSED: Communicating instructions to the computer

MATERIALS: overhead transparency
transparency marker

INSTRUCTIONS FOR MAKING:

1. Divide the transparency master into four equal columns
2. Print the following information in the columns:

15	15	15	15
14	14	14	13
13	13	11	11
12	12	10	9
11	7	7	7
10	6	6	5
9	5	3	3
8	4	2	1
D	C	B	A

Column A represents 2^0

Column B represents 2^1

Column C represents 2^2

Column D represents 2^3

INSTRUCTIONS FOR USE:

1. The teacher should lead the guessing game by asking a student to pick a number. Without telling the teacher what the number is, the student should respond to questions from the teacher regarding which column the chosen number is in.
2. Suppose the student picks the number 13. The teacher asks the following questions:

Is the number in column A?	Answer: Yes. (Teacher thinks 1 x 1)
Is the number in column B?	Answer: No. (Teacher thinks 0 x 2)
Is the number in column C?	Answer: Yes. (Teacher thinks 1 x 4)
Is the number in column D?	Answer: Yes. (Teacher thinks 1 x 8)

Since (1 x 1) + (0 x 2) + (1 x 4) +(1 x 8) = 13, the teacher can accurately guess that the student's number is 13.

3. After several such interactions between the teacher and the class, some students may have discovered the algorithm being used. If so, the teacher may want to let those students assume the roll of the teacher and guess the mystery numbers.

4. Now have students record on paper, from right to left, a one or a zero, based on whether the answer for listing in each column is yes or no. Example: Student picks the number 12. Teacher (or another student) asks:

Is it in column A?	Answer: no.	Record a 0
Is it in column B?	Answer: no.	Record a 0
Is it in column C?	Answer: yes	Record a 1
Is it in column D?	Answer: yes	Record a 1

Since 12 (base ten) = 1100(base two), the mystery number is 12.

PUNCH CARD SURVEY

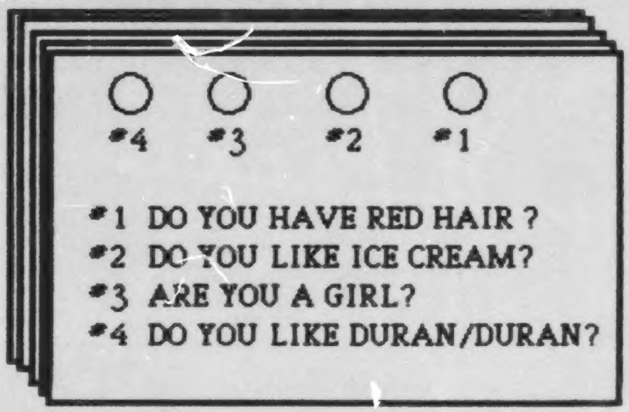
ESSENTIAL ELEMENT ADDRESSED: Communicating instructions to the computer
Use of the computer as a tool

MATERIALS:
3" x 5" index cards, one per student
hole punch
black marker
paper clips

INSTRUCTIONS FOR MAKING:

1. Punch four holes in index cards, one inch apart, along the 5" side of the cards.
2. Number each hole, 1 - 4, beginning on the right side.
3. In the space below the holes, write four questions that can be answered yes or no.
4. Have students write their name on the back of their card.

Example:



#1 DO YOU HAVE RED HAIR ?
#2 DO YOU LIKE ICE CREAM?
#3 ARE YOU A GIRL?
#4 DO YOU LIKE DURAN/DURAN?

INSTRUCTIONS FOR USE:

1. Give each student one card.
2. Have students read each question and indicate their answer to each question on the hole of the same number. If the answer is yes, they should cut off the top of the hole. If the answer is no, they should leave the hole intact.

3. Collect all cards, so that the holes are on the top.
4. Extend a paper clip, insert it through the first hole, and shake so that all those which have the top of the hole cut off will fall off the paper clip.
5. All cards which fall off will belong to those students who have red hair.
6. The same process can be used to locate all persons who like ice cream, are girls, or like Duran/Duran.
7. Now search for all boys who like ice cream. Search for everyone who is a girl or who likes Duran/Duran. Discuss and/or logic in this context.
8. Relate this process to the searching process done with most data-filing systems.

MOVIN' ON

ESSENTIAL ELEMENT ADDRESSED: Useful for all elements

MATERIALS:	manila folder
	20 3" x 5" index cards
	one die
	black marker
	4 1" squares, different colors

INSTRUCTIONS FOR MAKING:

1. Paste a copy of the pattern shown on the next page inside the manila folder.
2. Write questions covering computer concepts on the 20 index cards. Write answers on the back. (Example: What BASIC keyword is used for unconditional branching? Answer: GOTO)
3. Cut 4 1" squares of different colors to use for markers.

INSTRUCTIONS FOR USE:

1. Game may be played by 2 - 4 players.
2. Each player, in turn, is asked a question by another player. Questions are chosen at random from the deck.
3. If a given question is answered correctly, the die is rolled and the player's marker moved the number of spaces indicated. If incorrect, no move is made.
4. First player to reach the finish line is the winner.

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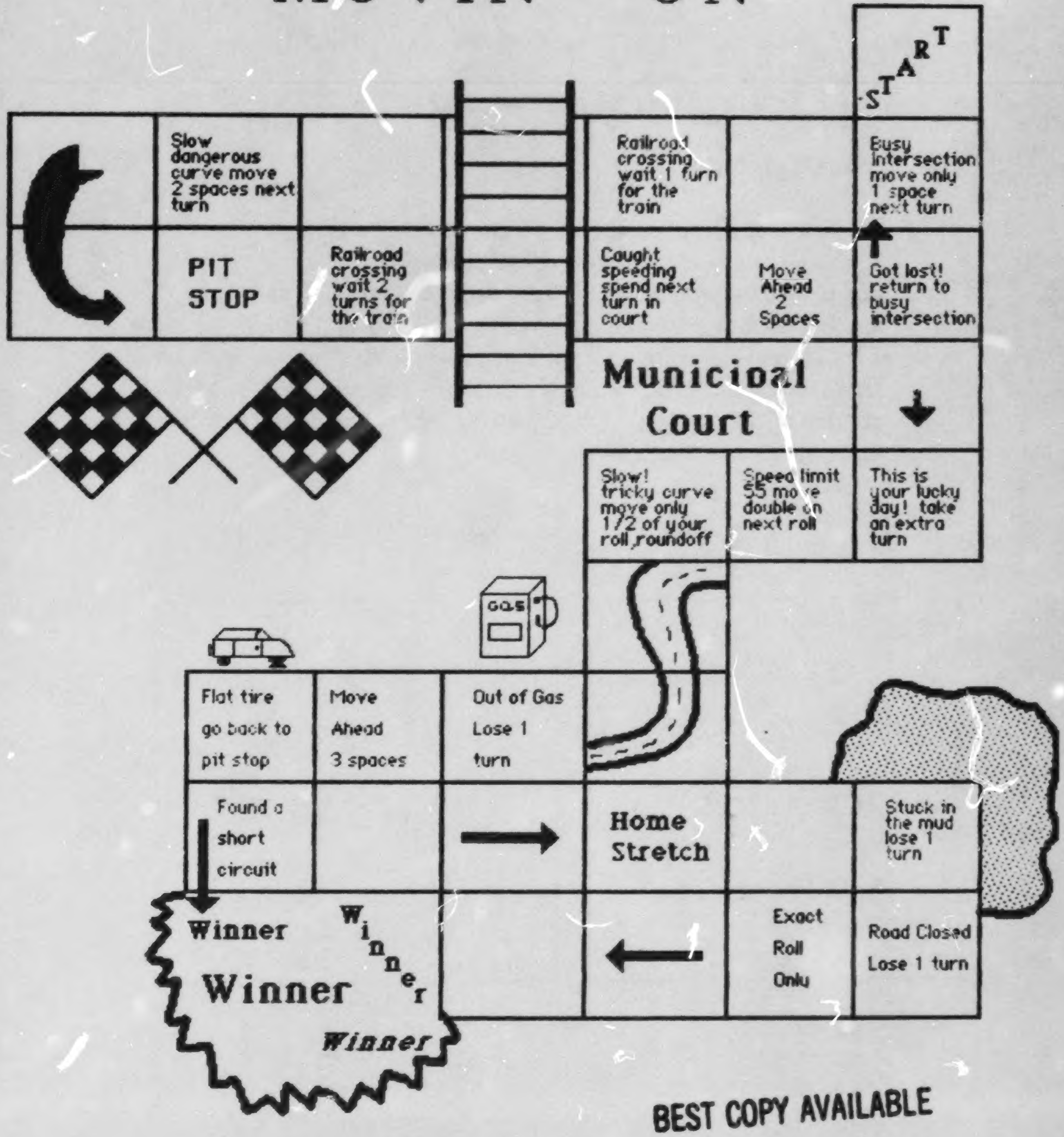
MOVIN' ON


START
Slow dangerous curve move 2 spaces next turn
Railroad crossing wait 1 turn for the train
Busy intersection move only 1 space next turn
PIT STOP
Railroad crossing wait 2 turns for the train
Caught speeding spend next turn in court
Move Ahead 2 Spaces
Got lost! return to busy intersection
Municipal Court
Slow! tricky curve move only 1/2 of your roll, roundoff
Speed limit 55 move double on next roll
This is your lucky day! take an extra turn
Gas
Flat tire go back to pit stop
Move Ahead 3 spaces
Out of Gas Lose 1 turn
Found a short circuit
Home Stretch
Stuck in the mud lose 1 turn
Winner
Winner
Winner
Winner
Exact Roll Only
Road Closed Lose 1 turn

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I HAVE/WHO HAS GAME

ESSENTIAL ELEMENT ADDRESSED: Computer-related terminology and use

MATERIALS:
unlined index cards (at least one per student)
markers
word lists (see attached five pages)

INSTRUCTIONS FOR MAKING:

1. On each index card, print I HAVE close to the to top and print WHO HAS at about the center of the card.
2. Begin with the bottom (WHO HAS) section of the first card, and write a definition of a term. Then write the term itself on the I HAVE portion of the next card. Continue in this fashion, so that the WHO HAS portion of the last card matches the I HAVE portion of the first card. (Note that the lists of words on the next five pages were constructed this way.)

Example:

I HAVE ENIAC WHO HAS First Programmer	I HAVE Ada Lovelace WHO HAS First electro-mechanical computer

INSTRUCTIONS FOR USE:

1. Shuffle all the cards.
2. Deal out one card per student, and additional cards to some students until the deck is exhausted.
3. Choose one student to begin the game by reading the bottom (Who Has) portion of his/her card.
4. The student in the class who has the appropriate term responds by saying "I have (term)" and then reads the Who/Has portion of his/her card.
5. Play continues in this manner until all terms and definitions have been used. The game ends by returning to the student who began the game.

I HAVE/WHO HAS Terms (Hardware)

(Note: So that the game proceeds as expected, the teacher should refer to this list during play.)

Card Number:

1. CRT (monitor)	1. device used to connect a computer to a telephone line for transmitting and receiving data
2. modem	2. central processing unit
3. CPU	3. input device used for typing data
4. keyboard	4. I/O device that stores data or program on disk
5. disk drive	5. physical computer equipment
6. hardware	6. hardware connected to basic computer unit
7. peripheral	7. output device for printing information on paper
8. printer	8. large computer system, usually designed for multiple users
9. mainframe	9. desk-top computer
10. microcomputer	10. tiny silicon wafer
11. chip	11. technique of printing using rows and columns of dots
12. dot matrix	12. produces text which looks typed
13. letter quality	13. allows several users to access the same computer at the same time
14. time-sharing system	14. devices that send information to and receive information from the computer
15. terminals	15. stores information
16. memory unit	16. displays or records processed information
17. output unit	17. input device that reads specially marked paper
18. optical mark reader	18. input device that reads cards
19. card reader	19. input device that responds to light on a screen
20. light pen	20. plots graphs and pictures

21. plotter
22. I/O devices
23. voice synthesizer
24. floppy disk
25. magnetic tape
26. robot
27. disk pack
28. artificial intelligence
29. minicomputer
30. hard disk

21. peripheral devices that do the job of both input and output
22. an output device which translates computer output into human-like sounds
23. common random access storage device
24. common sequential storage device
25. special purpose computer that performs mechanical tasks
26. collection of hard disks stacked on on top of another
27. devices that have abilities similar to that of the human mind
28. a medium-sized computer which can do several jobs at once.
29. a large-capacity magnetic storage device
30. a cathode ray tube display screen

I HAVE/WHO HAS Terms (History of Computers)

(NOTE: Teachers should refer to this list during the game in order to insure play proceeds.)

Card number:

1. abacus	1. set of numbered rods used for multiplication
2. Napier's Bones	2. developed slide rule
3. William Oughtred	3. machine with gears for adding and subtracting
4. Pascaline (arithmetic machine)	4. man's first aid to counting
5. fingers	5. inventor of logarithms
6. John Napier	6. invented first mechanical calculator
7. Blaise Pascal	7. developed Leibniz wheel
8. Gottfried von Leibniz	8. developed first punch card machine for weaving cloth
9. Joseph Jacquard	9. machine which revolutionized an industry by using data processing techniques
10. weaving loom with punched card instructions	10. father of computers
11. Charles Babbage	11. first programmer
12. Ada Lovelace	12. forerunner of modern digital computers
13. analytical machine	13. developed punched cards for 1890 census
14. Herman Hollerith	14. developed algebraic/binary logic used in computing
15. George Boole	15. example of first generation computer
16. ENIAC	16. used in first generation computers
17. vacuum tubes	17. programming language named after Blaise Pascal
18. Pascal	18. programming language named after the first programmer

19. Ada
20. binary
21. Mark I
22. transistor
23. integrated circuits
24. John Mauchly
25. Howard Aiken
26. John von Neumann

19. base-two number system
20. first electromechanical computer
21. used in second generation computers
22. devices used in third generation computers
23. teamed with Eckert to build ENIAC
24. developed Mark I at Harvard
25. introduced idea of storing a program
26. ancient calculator

I HAVE/WHO HAS Terms (Computer-related careers)

(NOTE: Teachers should refer to this list during the game in order to insure that play proceeds.)

Card Number:

1.	automation	1.	computer operators and keypunch operators
2.	operations personnel	2.	punch cards to prepare data for computer
3.	keypunch operator	3.	person who actually runs computer
4.	computer operator	4.	inputs data for computer use
5.	data-entry personnnel	5.	supervises and organizes tape libraries
6.	computer media specialist	6.	designs processes by which certain tasks can be done with a computer
7.	systems analyst	7.	writes the instructions that tell the computer how to perform a task
8.	applications programmer	8.	writes programs for the computer's operating system
9.	systems programmer	9.	installs and maintains computers
10.	computer technician	10.	highly educated computer professional
11.	computer scientist	11.	writes and markets programs for others' use
12.	software developer	12.	independent or franchise owner of computer store
13.	computer retailer	13.	designs computer systems
14.	computer engineer	14.	sells computer systems
15.	computer sales representative	15.	writes computer manuals
16.	technical writer	16.	trains others to use computers
17.	computer teacher	17.	using the computer to create and/or edit text
18.	word processing	18.	a special-purpose computer designed to perform mechanical tasks

19. robot
20. technical training
21. keyboarding skills
22. computer security specialist
23. marketing support representative
24. electronic cottage
25. information age
26. data-base specialist
27. artificial intelligence
28. CAD
29. CAM

19. required of computer technicians
20. sufficient typing speed to make using the computer feasible
21. responsible for protection of data from unauthorized use
22. responsible for training customers
23. societal trend to perform work with home computers
24. labor shift from industrial jobs to technical jobs
25. creates programs that allow access to information
26. simulating human thought processes
27. using the computer to assist in drawing/drafting
28. using the computer to aid in manufacturing
29. process of replacing or assisting work with a machine

I HAVE/WHO HAS Terms (Word Processing)

(NOTE: Teachers should refer to this list during the game in order to insure that play proceeds.)

Card Number:

1. word processing	1. light on screen that shows where the next letter will be typed
2. cursor	2. to place new letters in-between others already typed
3. insert	3. to remove characters or text from document
4. delete	4. to substitute one set of characters for another
5. replace	5. a list of titles stored on a disk
6. catalog or directory	6. to type a line of text so that the margins on each side are equal
7. center	7. symbol that is typed on the screen
8. character	8. instructions given to the word-processing system
9. command	9. duplicate text without destroying original
10. copy	10. put text into word processor
11. enter	11. title invented for a document
12. filename	12. set up arrangement of text on a page
13. format	13. print text so that each line touches the right and/or left margins
14. justify	14. list of word processing options
15. menu	15.combine several sources into one document
16. merge	16.program section devoted to one set of tasks
17. mode	17. relocate a line or larger section of text
18. move	18. helpful message or question from word processor
19. prompt	19. transfer information from a disk into a computer's memory

20. retrieve or load	20. transfer information from computer's memory to a disk
21. save	21. movement of lines of text over screen from top to bottom, left to right, or vice versa
22. scrolling	22. blank spot in a line on the screen
23. space	23. procedure followed by most word processors as the cursor moves to end of line (eliminates necessity to use carriage return after each line)
24. wrap-around	24. text entered into word processor and stored on a disk
25. file	25. to look for a particular word in a document on the word processor
26. find	26. print the first character a certain distance from the left margin(usually at the beginning of a paragraph)
27. indent	27. prepare a disk to store information on it
28. initialize	28. replace old text with new text
29. overwrite	29. computer system for handling words

SCRAMBLED EGGS

ESSENTIAL ELEMENT ADDRESSED: Computer-related terminology and use
History and development of computers

MATERIALS:

L'eggs eggs
laminating plastic (optional)
scissors and scotch tape
lists of
- a) computer vocabulary and definitions
- b) significant developments in the history of computing
- c) names of people involved in history of computing and the development associated with those people
- d) pictures of computer hardware and words associated with that hardware

INSTRUCTIONS FOR MAKING:

1. Print or type various lists
2. Laminate each page (optional)
3. Cut each list into two parts (Example: Cut vocabulary term from definition so that each pair can be matched later.)
4. Place each group of cut-up lists in a L'eggs egg, with appropriate directions for each activity.

INSTRUCTIONS FOR USE:

Use eggs as activities for drill and practice on topics suggested here or any other category you think necessary to achieve desired level of competency on essential elements described. Some teachers may want to have students time one another as they match component parts.

COMPUTER BINGO

ESSENTIAL ELEMENT ADDRESSED: Computer-related terminology and use.

MATERIALS:
8 1/2" x 11" sheets of paper, one per student
pencils, markers (beans or paper circles will do)
list of computer terms

INSTRUCTIONS FOR MAKING:

1. Give each student one sheet of paper.
2. Have students draw six vertical lines down the 11" side of paper.
3. Have students draw six vertical lines across the paper, making 25 squares on the page.
4. Designate the third square on the third row as a free space. Example:

		FREE		

(A full example is include on the next page if reproducing is possible)

5. Write a list of computer terms on the board. Have students select terms at random and write one term in each of the 19 squares.
6. Have students exchange playing cards.

INSTRUCTIONS FOR USE:

1. Teacher reads a definition for one of the terms.
2. Students who have the term being defined mark an X (or place a game marker or bean) on that space on their card.
3. Student who marks all the terms on his/her card first wins.

BEST COPY AVAILABLE

COMPUTER

B	I	N	G	O
		FREE		

NAPIER'S BONES

ESSENTIAL ELEMENT ADDRESSED: History and development of computers

MATERIALS: Heavy paper (11" x 10"), black marker, ruler, scissors

INSTRUCTIONS FOR MAKING:

1. Divide the 11" x 10" paper into 1" squares
2. Draw a key on the top square on the left-hand side.
3. Write the numbers 1 - 9, one number per square, in each square on the left-hand column.
4. Write the numbers 1 - 9, one number per square, in each square on the top row.
5. Use a black marker to connect opposite corners of each of the remaining square with a diagonal line.
6. Match each number across the top with each number written down the side, writing in the product obtained from multiplication of the 2 numbers in the square where the two meet. The first digit in the product should be written above the diagonal line, and the second digit below it. If the product is a one digit number, place that digit in the botton space, and write a 0 in the space above. An example follows:

🔑	1	2	3	4	5	6	7	8	9
1	0/1	0/2	0/3	0/4	0/5	0/6	0/7	0/8	0/9
2	0/2	0/4	0/6	0/8	1/0	1/2	1/4	1/6	1/8
3	0/3	0/6	0/9	1/2	1/5	1/8	2/1	2/4	2/7
4	0/4	0/8	1/2	1/6	2/0	2/4	2/8	3/2	3/6
5	0/5	1/0	1/5	2/0	2/5	3/0	3/5	4/0	4/5
6	0/6	1/2	1/8	2/4	3/0	3/6	4/2	4/8	5/4
7	0/7	1/4	2/1	2/8	3/5	4/2	4/9	5/6	6/3
8	0/8	1/6	2/4	3/2	4/0	4/8	5/6	6/4	7/2
9	0/9	1/8	2/7	3/6	4/5	5/4	6/3	7/2	8/1

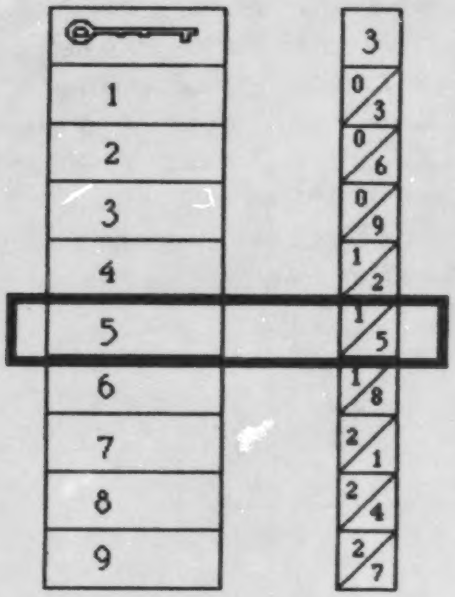
7. Cut out each column on the sheet so that they can be handled separately for use in solving multiplication problems.

INSTRUCTIONS FOR USE:

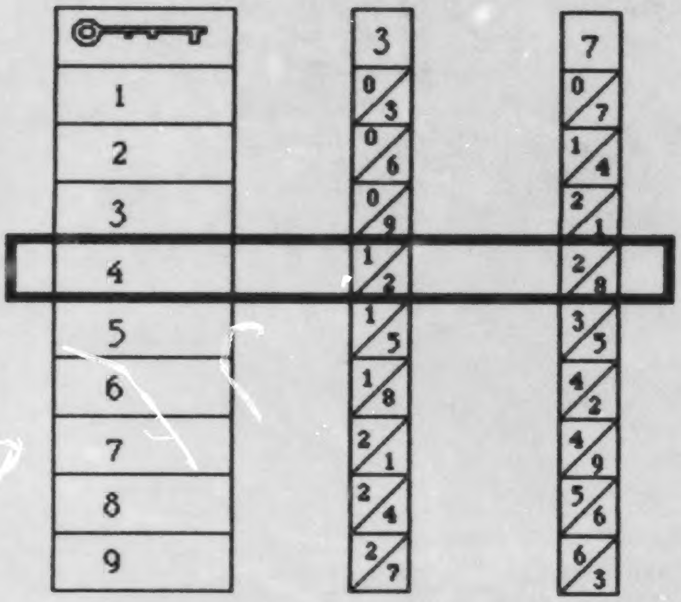
1. To solve one-digit multiplication problems with Napier's Bones:

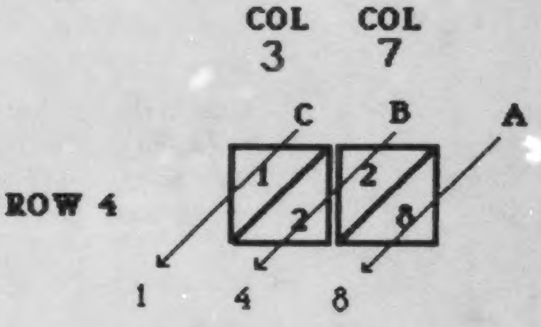
Line up the key card and the card for the number being multiplied.

Example: To multiply 5 x 3, line up the key and the 3 card. Move down the key card to 5 and then move straight across. You come to the answer 15.



2. To solve multiplication problems with one two-digit number: Example: To multiply 37 x 4, line up key card, 3 card, and 7 card. To get an answer, start at A and record the number there in the one's place. At B we find two numbers in line, so they are added to get 4. The result of B will be placed in the ten's place. The answer for 37 x 4 is, then 148.

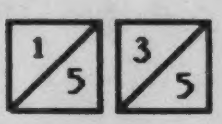

1
2
3
4
5
6
7
8
9
3
0/3
0/6
0/9
1/2
1/5
1/8
2/1
2/4
2/7
7
0/7
1/4
2/1
2/8
3/5
4/2
4/9
5/6
6/3


COL 3
COL 7
C
B
A
ROW 4
1
2
2
8
1
4
8

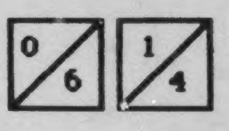
3. To solve multiplication problems with two-digit numbers:

Example: To multiply 37 x 25, work with the number in the one's place (5) first.

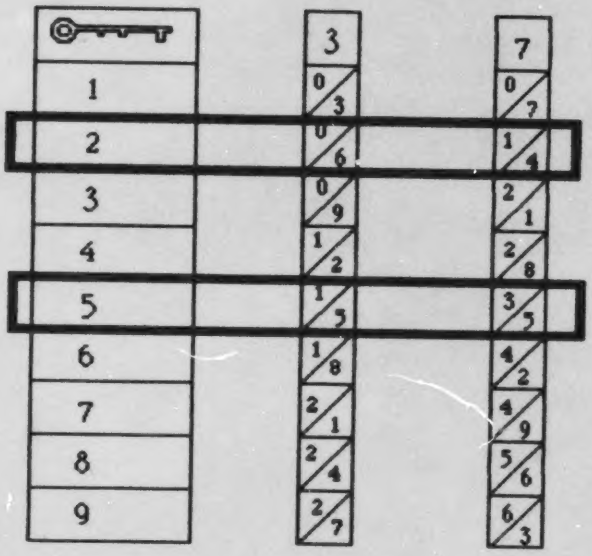
Multiplying 37 x 5 will result in:

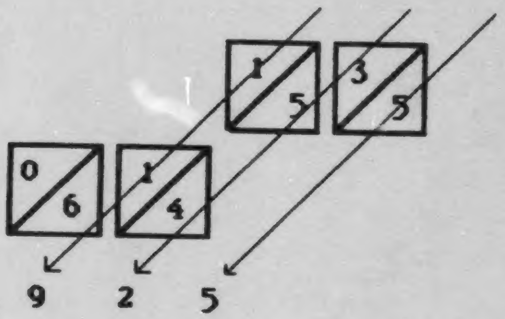


Multiplying 37 x 2 will result in:



Line up the numbers to find the product. The 5 was in the one's place and the 2 in the ten's place in the problem, so numbers must be lined up in this manner.





The Abacus

ESSENTIAL ELEMENT ADDRESSED: History and Development of Computers

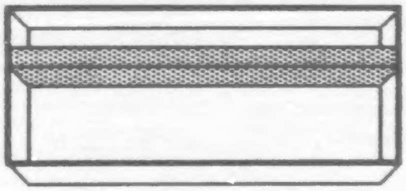
HOW TO MAKE IT

Materials Needed:

- small box
- string
- tape
- beads
- glue
- pencil or marker

Instructions:

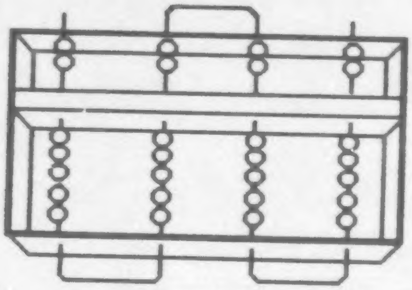
(1) Push the box lid or other divider into the box so it is parallel to the bottom and perpendicular to the sides. Trim for a tight fit and glue the lid permanently into position.



(2) Measure the long side of the box. Make 4 holes, equal distance apart, on the top of the box, the bottom of the box, and the lid on the center of the box.

(3) Wind tape around the end of a long string to make it easy to thread through the holes in the box.

(4) Use the diagram below to guide you in threading the string through the holes in the box and for placing the correct number of beads in each section of the abacus.



(5) After making sure the string is pulled tight, fasten the ends of the string with tape or by other means.

HOW TO USE IT:

(1) All beads below the center bar represent the value of 1.

(2) The two beads above the center bar each represent a value of 5.

(3) Reading from right to left, each string represents place values of 10.

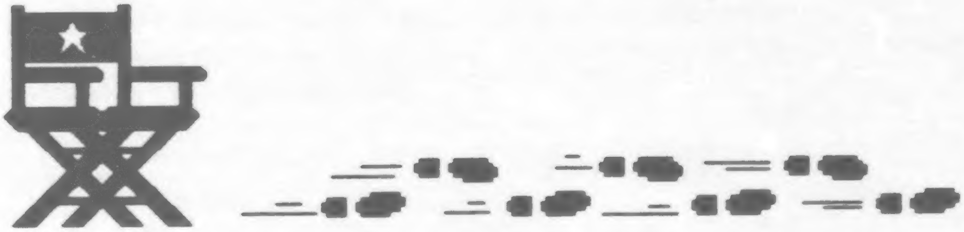
(4) The first row of beads on the right represents the numbers 1-9. When another bead is added, the number becomes 10 and it is necessary to move a bead in the second row which represents tens.

(5) The numbers in the next row are hundreds.

(6) The numbers in the next row are thousands.

I MUST HURRY!!

They have gone
and I am their
leader.



COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) nondiscrimination in extracurricular activities and the use of school facilities;

(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) nondiscriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Office for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964; EXECUTIVE ORDERS 11246 AND 11375; TITLE IX, 1973 EDUCATION AMENDMENTS; REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; AND VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

It is the policy of the Texas Education Agency to comply fully with the nondiscrimination provisions of all federal and state laws and regulations by assuring that no person shall be excluded from consideration for recruitment, selection, appointment, training, promotion, retention, or any other personnel action, or be denied any benefits or participation in any programs or activities which it operates on the grounds of race, religion, color, national origin, sex, handicap, age, or veteran status (except where age, sex, or handicap constitute a bona fide occupational qualification necessary to proper and efficient administration). The Texas Education Agency makes positive efforts to employ and advance in employment all protected groups.

Texas Education Agency
201 East 11th Street
Austin, Texas
GE5 244 02
February 1985